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Distillation Under High Vacua

THE Chemical Engineering group and the London Section of the Society of Chemical Industry spent an exceedingly interesting evening on November 7 discussing one of the latest advances in chemical technology, industrial distillation under a vacuum so high that the free path of the molecules is almost unimpeded. For this reason the process is termed "molecular distillation." It is necessary to reduce the pressure of permanent gas as low as 10^{-6} atmospheres, so that the process was impossible until the Langmuir condensation pump had been developed. It is, indeed, only within the last nine years that molecular distillation has come to the fore. Even now, it is not a process that is used if an alternative happens to be available.

Dr. F. H. Carr, who has done much towards the development of this method for the purpose of separating vitamins without decomposition, characterised the method as expensive, elaborate, difficult, and not likely to be adopted if other methods were available. His apparatus was first erected to isolate, or concentrate vitamin E. Before it could get into production means were found to produce this vitamin synthetically, so the molecular distillation apparatus was turned over to vitamin D. Meanwhile, a method of purifying this by crystallisation was discovered, and again the molecular distillation apparatus was not needed, but was turned over to vitamin A. For the concentration of this material no other method is known, and molecular distillation holds the field.

This method enables compounds of considerable complexity, including sugars and triglycerides, to be sorted out in the order of their molecular weights. It is a very slow process, and being expensive, it is desirable that its limitations should be understood. These are first, that it is a method to be used to purify or concentrate complex substances that would decompose under the action of heat; and secondly that it is not a method suitable for complete distillation of a mixture, but that it may be an economical way of obtaining a small distillate, or of leaving behind a concentrated residuum from which a volatile impurity has been freed.

In principle the apparatus consists of heating the liquid to be distilled, in the presence of a condensing surface arranged a few centimetres distant, the whole being enclosed in a chamber evacuated to such a degree that the mean free path of the distillate molecules in the residual gas is comparable with or greater than the distance between the evaporating and condensing surfaces. In order to maintain these very small pressures of the order of one microbar, special arrangements must be made whereby the vapours carry away from the distillation chamber any gas that may be present.

It is to be noted that even at the very low pressures used, some slight decomposition may take place, and that this will form traces of permanent gas sufficient to destroy the conditions of high vacua on which the process depends. Under these conditions there is no true "boiling" of the distilland, the process involving flight of the molecules individually from the heated fluid to the condensing surface. A temperature rise of 10° C. may double the distilling speed, but may also lead to decomposition which forms enough permanent gas to reduce the rate of passage of the molecules almost to zero. It is, therefore, necessary to investigate closely the temperature conditions that will give the optimum results. The process of molecular distillation, it will be appreciated, demands for success that the liquid to be distilled shall be spread over the heating surface as a film having maximum area for a given volume.

During the discussion, Dr. R. Lessing said that very great advances would become possible in chemical engineering if means could be found for maintaining a continuous film in motion in such a way that it was continually "turned inside out" to produce fresh surfaces so that the lengthy process of convection, or the still longer diffusion, would not be necessary to present fresh surfaces of low concentration to the exterior. It was Dr. Lessing himself, we believe, who, many years ago, pointed out that distillation is essentially a scrubbing process. This principle would thus affect every distillation and scrubbing operation. It is evident that in processes in which a gas and a liquid are desired to interact chemically or physically, the maximum surface contact is necessary for high efficiency, and this would be secured by causing the liquid to flow in films over surfaces on which the gas impinges with turbulent flow. Even here, however, diffusion and other slow physical processes slow up the reaction by virtue of the time taken for the concentrated surface layers to pass beneath the surface and to be replaced by fresh liquid of lower concentration.

There is no doubt that assessments of industrial concerns are far too high to-day under modern legislation, but owing to the fact that rates are payable only on one-quarter of the net annual value, factory owners generally throughout the country have not thought it worth while to contest the amount of assessment and have allowed it to pass.

—P. Michael Faraday.

Notes and Comments

Overseas Trade in October

THE more satisfactory condition of Britain's trade indicated by the Board of Trade figures for September has been followed up by the rather more decisive improvement shown by last month's returns. Although the totals for imports, exports and re-exports are still well below those of a year ago, the rises compared with the previous month are the largest monthly increases since February, and considerably in excess of the usual seasonal increases. With exports in October amounting to £42½ millions, the highest figure since March, imports to £79 millions, and re-exports to £5½ millions, the adverse trade balance stands at £31 millions, against £43¼ millions a year ago; but this reduction is mainly due to the contraction in imports from £96 millions in October, 1937. However, the figures for the chemical trade indicate a general activity above that of other manufacturing trades, with all three categories of imports, exports and re-exports of chemicals, drugs, dyes and colours being substantially higher in value than those of a year ago. The signing of the American trade agreement on Thursday will be welcomed as a most constructive step in promoting overseas trade.

A Deterrent to Synthetic Production of Diesel Oil

DR. A. J. V. UNDERWOOD, in the *Fuel Economy Review*, has given an excellent review of the oil from coal situation as it is to-day, and the possible future developments. In the course of the review, he points out that the guaranteed preference of 8d. per gallon on home-produced petrol and Diesel oil now incorporated in the Finance Act, 1938, is subject to a reduction of 1d. per gallon when home production of motor spirit or road Diesel oil reaches 20 per cent. of the total consumption and a further reduction of 1d. per gallon for each additional 5 per cent. He considers that this regulation of preference applied separately to motor spirit and road Diesel oil penalises the home producer of Diesel oil and hampers its synthetic production. From figures given in the Falmouth Report, it is clear that the reduction in preference on motor spirit would become operative when the home production reached 260,000,000 gallons, but in the case of road Diesel oil it would become operative when production reached 8,800,000 gallons. In 1936 the production of Diesel oil from Scottish shale was 12,500,000 gallons, or 28 per cent. of the consumption.

Advertising and the Press

IN the course of a characteristic talk at last week's meeting of the Incorporated Advertising Managers' Association, Sir Ernest Benn made a pertinent reference to the connection between advertising and the Press, and criticised the value of co-operative advertising. He said that advertising was an appeal to the individual to spend his money. Advertising paid for the Press; that was not in dispute. But as a Fellow of the Institute of Journalists, he would strongly resent any suggestion that the advertiser controlled the Press. Who were the advertisers? They were the shopkeepers and the manufacturers, the six thousand employers of labour who represented the advertising class. If they searched their newspapers, could they find him one line of encouragement, one word of praise, or a pat on the back, for the man who was doing something to better the economic conditions? There was a movement afoot for co-operative advertisng. Frankly, he (Sir Ernest) was a non-believer. Co-operative advertising seemed to him to be a contradiction in terms. The very essence of atlvertising, it seemed to him, was competition.

The Fiftieth Anniversary of the Pasteur Institute

THE fiftieth anniversary of the founding of the Pasteur Institute in Paris, celebrated on Monday, calls to mind a revolutionary achievement in scientific research which altered the whole course of medical practice. Louis Pasteur first achieved prominence through his study of crystals, and through this work he was offered a professorship at Lille. Here he studied the processes of sugar fermentation and arrived at his famous conclusion that fermentation was due to living organisms. Through his investigations of the silkworm plague and of anthrax in sheep he found that these diseases were caused by organisms also. Following upon these discoveries, he initiated the practice of immunisation by injection of bacilli, his most conspicuous success being the preparation of a serum treatment against hydrophobia. The Institute continues Pasteur's work in the preparation of vaccines and serums, two outstanding past achievements being the preparation of a serum for the treatment of diphtheria and the discovery of the malaria germ. But to Pasteur alone are due the basic conceptions behind the modern sciences of bacteriology and biochemistry; a large proportion of the manufacturing chemists' work has its origins in Pasteur's discoveries.

Annual Report of the Smithsonian Institution

THE annual report of the Board of Regents of the Smithsonian Institution, Washington, for the year ending June 30, 1937, which has just been received, is a voluminous work running to 580 pages, including a comprehensive index. The report is in three sections: the first is the annual report of the Secretary giving an account of the operations and condition of the Institution for the year, the second is the report of the executive committee of the Board of Regents, and is concerned with the financial affairs of the Institution, and the third is a general appendix comprising a selection of miscellaneous memoirs "of interest to collaborators and correspondents of the Institution, teachers, and others engaged in the promotion of knowledge." This last section is of most appeal to the general reader; it contains memoirs on a very wide range of subjects connected with natural phenomena. Of these, "Our water supply," "The emergence of modern medicine from ancient folkways," "National and international standards for medicines," and "The healing properties of allantoin and urea" are the most interesting.

Development of Allantoin as Therapeutic

THE last-named memoir, by W. Robinson, is an excellent review of the investigations leading up to the use of allantoin and urea in healing wounds. In 1929 it was annouced that applications of sterile blowfly maggots were an effective treatment for slow-healing wounds, but it was some few years before the effect was found to be due to the presence of allantoin in the maggot excretions. Synthetic allantoin was found to be equally efficacious, and in 1935 a report of its success had wide publicity. This was a great stimulus to manufacturing chemists, and over 80 allantoin preparations have been advertised in the U.S.A. for medical use. As sometimes happens, a report was made of the successful use of allantoin in the treatment of chronic ulcers as far back as 1912, but there was little response and the discovery was soon forgotten.

The Wood Naval Stores Industry*

Its Rise and Development

By
W. GARVIE

THE term "Naval Stores" is not capable of accurate definition; originally it applied essentially to the products obtained from the oleo-resin exuded by various species of living pine trees—i.e., rosin and turpentine. To-day its meaning is much wider, and for the purposes of this address will be taken to cover the multitude of products derived, directly or indirectly, from the pine, living or dead.

The Wood Naval Stores industry is, for all practical purposes, an American monopoly. It arose as follows: Along the sea-board of what are now Southern and South-Eastern States of America ran a great belt of primeval pine forest—a belt some 200 or more miles deep and 1,000 miles long. This forest contained enormous numbers of the long leaf pine (*Pinus palustris* or *Pinus Australis*), which was to become the chief producer of rosin and turpentine, creating for America a pre-eminent and lasting position as the world's largest producer of Naval Stores.

Early Utilisation of Stump Wood

From 1700 onwards the production of gum rosin and turpentine grew apace, and with it an ever-expanding demand, but the forests shrank until about the year 1900 the seriousness of the situation became apparent to all. At this time America was producing annually over 2,000,000 barrels of gum rosin and 700,000 barrels of turpentine. It is interesting to note that to produce these quantities requires the activity of nearly 200,000,000 trees which would occupy something like 4,000 square miles of dense unbroken forest.

After two centuries of lumber cutting there naturally existed immense areas of "cut-over" land carrying the old stumps in astronomical numbers. As early as 1865 patents were granted for the treatment of these resinous stumps and a small plant was erected at Wilmington, North Carolina, which later on led to the recovery of certain useful products by destructive distillation. This method could not recover the rosin, which the stumps were known to contain. It yielded turpentine of very poor quality. The next step was to attempt to distil off the turpentine from the stump wood before dry distilling it; the results were not encouraging, the turpentine was of low quality and costs were high. There appeared to be no hope of easing the pressure on the gum rosin industry until about 1900 when Homer T. Yaryan, of Toledo, Ohio, began to experiment along new lines. U.S. Patent No. 915,400 dated May 16, 1909, was issued to him, this, coupled with a further patent dated May 16, 1911, marks the true beginning of the Wood Naval Stores industry. The term "Wood Naval Stores" can now be defined as "those products derived directly or indirectly from the treatment of dead pine stumps." Like most other definitions this too has its limitations and might be extended to include the products of the destructive distillation of wood.

Homer T. Yaryan and his associates erected in 1909, at Gulport, Mississippi, a plant in which his process was worked. In the first operating year—viz., 1910/1911, it produced 14,000 barrels of rosin, 1,700 barrels of turpentine and 700 barrels of pine oil. The Yaryan Naval Stores Co. is no longer in existence as such. In 1913 the Newport Co. commenced operations, to be followed by the Mackie Pine Products Co. in 1918, and the Hercules Powder Co. in 1920, all of which are still in being. Others followed later, until to-day about a dozen are in operation.

During the season 1937/1938, the production of basic steam distilled wood products amounted to 700,000 barrels of rosin, 110,000 of turpentine and approximately 5,000,000 gallons of pine oil. Wood rosin in that year represented 30 per cent. of the total production of rosin in the United States of America.

The oleo-resin exuded by the long-leaf pine of the Southern States of America, is essentially a solution of rosin in turpentine. Turpentine at the moment of exudation is practically pure pinene. The rosin to turpentine ratio is roughly 3:1. The stumps contain approximately 20 per cent. of extractable material, made up of rosin, pinene and many other terpene hydrocarbons, together with the terpene alcohols, etc., which go to form pine oil. It is evident, therefore, that some of the pinene originally present in the living tree has undergone profound chemical changes as the result of prolonged exposure. On the average, one ton of stump wood will yield 360 lb. rosin, 56 lb. turpentine and allied substances, and 30 lb. pine oil—a much different ratio to that obtaining in the actual oleo-resin—accounted for mainly by evaporation loss of the liquid constituent. The products it is desired to extract and separate fall into four main groups—rosin, turpentine, dipentene, etc., and pine oil.

The first problem which confronted the pioneers was to find a cheap method of reducing the wood to small size. A good many years passed before engineers were able to design and produce machinery which would accomplish this successfully and economically on a large scale. Nowadays a two-stage hogging and shredding operation is employed, producing a large proportion of splinters some $\frac{1}{4}$ in. thick and up to $1\frac{1}{2}$ in. long.

The extraction processes are of two types: (a) distillation of the volatile constituents by live steam, saturated or superheated, followed by solvent extraction of the residual rosin, or (b) treatment of the wood by a solvent filtration, and subsequent distillation and fractionation of the solution.

Extraction Process Most Generally Employed

The latter method is to-day the more generally employed. Extraction is rarely pushed to the limit, the end-point is decided by economic considerations. The extraction operation is, in general, carried out by filling the extraction towers or retorts with the prepared wood, which is supported by a false perforated bottom through which steam and solvent can be passed. These retorts are anything up to 20 ft. high and 8 ft. diameter and are usually constructed of a non-corroding alloy to resist the attack of the formic and acetic acids present in the wood, ensuring that the rosin will be free from metallic contamination. The extraction is usually of the counter-current type, batteries of retorts are connected in series, the solvent flow being arranged so that the last one which has been under extraction receives the fresh solvent. The alternation of cycles follows standard practice. When the extraction has been taken to the predetermined point, the vessels are drained off and the residual solvent recovered by steam distillation of the exhausted chips. The solvent employed in process (a) is usually a petroleum naphtha boiling between 100° C. and 150° C., process (b) requires an entirely different one.

The next steps vary from plant to plant, but they all lead to the point where a solution of rosin in solvent is obtained and a separate solution of liquid terpenes, or a mixture of them freed from solvent by a preliminary fractional distillation. The rosin solution is pumped while hot into tall vessels where it is given a preliminary refining to remove certain oxidised bodies soluble in the hot solvent, thereafter the solution is filtered free of any powdered wood which may have come through. To recover the solid rosin the solution

* From a recent address to the Birmingham Paint, Varnish and Lacquer Club. The author is associated with Newport Industries Inc.

is evaporated under reduced pressure in film type evaporators. The product so obtained is the FF wood rosin of commerce. (Gum rosins are obtainable in a wide range of colour grades, ranging from D, almost black, to X which is extremely pale, the intermediate colour grades are—E, F, G, H, I, K, M, N, WG and WW).

The second major problem confronting the wood rosin producers, lay in the fact that the recovered rosin, being of FF colour grade, had a relatively low commercial value, and a comparatively restricted market. Means of producing paler grades from FF simply had to be found. Extensive research was undertaken to this end. Two of the largest producing companies ultimately arrived at a practical solution to the problem—each along different lines.

Decolorising Rosin by Activated Earths

FF wood rosin, when viewed by transmitted light, has a deep rich ruby colour, there are present, however, yellow and brown colour bodies masked by the ruby colour. These colour bodies are not found in gum rosin. A successful decolorising process must not only remove the visible ruby red, but also the yellow and brown colour bodies, which have high staining power. Both decolorising processes satisfy this condition to a practical degree. One process is based on the use of decolorising earths, the other, I believe, works on the selective solvent principle; I am only competent to describe the former.

Decolorising rosin by activated earths differs in one important respect from most operations of this kind, in that, to raise the colour from FF to WW involves the absorption of about 25 per cent. by weight of the rosin. In other words, an abnormally high ratio of earth to rosin is required. The process is conducted by passing the rosin solution through large vertical retorts packed with earth; the design of the apparatus follows closely that already described for the solvent extraction—cycle operation is employed. The rosin solution of roughly 20 per cent. concentration, is washed with water to coagulate any colloidally suspended matter before being passed through the decolorising system. The colour grade obtained is governed by the speed at which the solution passes through. Alternative methods of control are available. The mechanics of the decolorising process have been closely studied. Fresh dry fullers earth first absorbs nothing but rosin, leaving the colour bodies untouched. When rosin saturation is reached a reversal takes place, the rosin absorbed by the earth is exchanged for the colour bodies, the earth finally containing these alone.

Revivication of the Earths

From the fact that a large earth to rosin ratio is employed it is easy to deduce that revivication is a matter of supreme importance. An eminently neat and practical method was ultimately devised by Palmer—U.S.P. 1794537. The method depends on the treatment of the saturated earth *in situ* with a mixed solvent of critical composition, one having the added advantage of easy recovery. The dark extracted colour bodies have interesting properties and find a ready market. Needless to say the pale rosin is recovered by vacuum distillation, it is run directly from the stills into metal drums which are then hermetically sealed.

FF wood rosin has a lower melting point, acid value and ester value, than American gum rosin. It is prone to crystallise under certain conditions and its chemical reactivity is also lower than that of gum rosin. Nevertheless, a large and important market has been developed for it. Some of these defects persist even after the refining process just outlined, though the melting point and acid value have risen.

The nature of the extraction and refining processes exerts a marked influence on the properties of the rosins produced by them. For this reason, the pale wood rosins marketed by the two producing companies differ in certain respects. In describing what may be the lesser developments on the wood rosin side, I can only do justice to those due to the company I am associated with, you would not wish me to deal with those not entirely familiar to me. Each of the two pale wood rosin producers have taken their own line, both have made contributions of the greatest value to the technical and commercial development of the industry.

FF wood rosin, as already stated, suffers certain disabilities when compared with gum rosin, some of these disabilities persisting through the refining process. A remarkable measure of success has attended the efforts to overcome these defects—and has led to the production of certain brands which are distinctly superior to gum rosin in given directions. Wood rosins can be divided into five broad groups: Natural, physically treated, chemically activated, soda treated, combination treatment.

Natural wood rosins are those which have not received any specific treatment other than decolorising. They find their chief use in the manufacture of linoleum, ester gum and synthetic resins, and in size making by the delthirna process for which they are particularly suitable. Natural wood rosins decolourised by selective solvents may have somewhat wider applications.

Chemically activated rosins contain a minute trace of a catalyst, too small to influence the properties of the rosin other than in the desired direction. They will react in a most satisfactory way with glycerol, lime and the hardening metals. They are excellent for all the normal requirements of the paint and varnish industry. Among their chief uses is the manufacture of ester gum.

Physically Treated Rosins

Rosin consists essentially of abietic acid which can exist in a number of isomeric forms. Isomeric changes can be brought about by the application of heat, conferring new properties on the rosin. Physical treatment, therefore, means the application of heat of varying temperatures for varying times, coupled with conducting the operation under different pressure conditions and in the presence or absence of steam. The knowledgeable manufacturer can ring the changes on these variants to enable him to produce a wide range of wood rosins, each with highly specialised and often extremely valuable properties.

Physical treatment can also be designed to confer high solubility characteristics and consequent freedom from crystallisation in the molten condition or in solution. Physical treatment is also arranged to raise the melting point and viscosity, both of which can be made greater than that of any gum rosin available to-day. Physically treated wood rosins have a high reactivity towards lime and the hardening metals.

Soda treated rosins are of no practical interest to the paint and varnish manufacturer. They have been reacted with a small quantity of alkali (1 per cent. Na_2O) and are used chiefly in the soap and paper industries.

It requiries no vivid stretch of the imagination to see that some of these methods of treatment can be combined. Developments along these lines are proceeding apace.

Manufacturers of pale wood rosins are jealous of the purity and cleanliness of their goods. The conventional rosin barrel of commerce is a poor receptacle for a high grade product. Much thought has been given to the best method of packing, very thin iron drums are now practically standard for pale grades. These have many advantages, loss of contents is eliminated, complete cleanliness ensured and quite marked savings in transport costs accrue.

The advantages offered by wood rosin can be summarised very briefly as follows: (1) Extreme degree of mechanical and chemical purity; (2) strict standarisation of quality and colour grading; (3) special qualities for a given purpose; and (4) packing designed to preserve cleanliness and purity.

Mention must be made of its only important disability. Mineral oil solutions of wood rosin have a distinctly inferior di-electric constant to equivalent solutions of gum rosin, rendering them less suitable for the manufacture of insulating oils.

The manufacture of derived products marks another stage

in the development of the Wood Naval Stores industry. "Natural" wood rosins, when limed, have a lower solution viscosity for a given percentage of combined lime, than gum rosins. This difficulty has been overcome by treatment of the rosin before liming. Limed wood rosins are now available which have a higher melting point and higher solution viscosity than gum rosin limed to the same degree. In addition, limed wood rosins of almost X colour grade are made.

In the United States of America a market has been developed for very cheap paints which have a fairly large water content. Limed rosin is an important ingredient. A solution of ordinary limed rosin in, say white spirit, will gel if used in a formulation containing appreciable percentages of water. The problem was to find a means of manufacturing a gloss oil (solution of limed rosin in a suitable solvent) based on limed rosin, which would function satisfactorily under these difficult conditions. The problem was solved by the development of a new liming technique and the design of special plant to suit it. Pretreatment of the rosin is a factor of importance. These gloss oils have a lower acid value than the percentage of lime used would lead one to predict, i.e., to attain a given acid value less lime is required than in the older liming procedure. The practical value of this is, the films formed by these oils are less tacky and more flexible and dry more rapidly than the older oils, lime content for lime content. The lower acid value reduces livering troubles in the presence of basic pigments.

The success attending the efforts towards improving lime hardening rosins, encouraged the industry to turn its attention to other resinates. My own principals devoted their attention to zinc resinate, and produced a zinc resinate of particularly fine quality. The new form of zinc resinate has a minimum melting point of 130° C., a calculated acid value of 15 and a zinc content of 4.85 per cent. The colour lies between WW and X colour grades. It is more compatible with solvents, drying oils and resins than zinc naphthenate.

Claims Made for a New Zinc Resinate

The claims made are: (1) Promotion of through drying; (2) increased wetting and dispersion with consequent reduction in paint grinding time; (3) marked reduction of flooding and floating; (4) elimination of wrinkling; (5) freedom from livering with basic pigments; (6) ability to control the gelation of wood oil better than limed rosin; (7) ability to reduce markedly the skinning tendency of all varnishes; and (8) inhibits loss of drying strength on storage of paints and enamels.

In the extract from the stumps, solid bodies other than rosin are found. Little attention was given to their exploitation until comparatively recently. A group of them has been isolated and marketed in the form of a complex mixture, the chemical constitution of which has not been fully elucidated. Investigation of this substance proves it to have valuable properties.

The complex mixture of liquids extracted from the stumps has a boiling range from 150° C. to 240° C. approximately. A very rough preliminary fractionation would yield three fractions—150°/180° C.: 170/210° C.: 200°/240° C., i.e., turpentine, dipentene, etc., and pine oil, all in a very crude state. Each of these fractions is very complex in constitution.

For the preparation of steam distilled wood turpentine, the crude turpentine fraction is treated with a moderately strong caustic soda solution brought into intimate contact with it by mechanical agitation. Acetic, formic and any other acids derived from the wood are neutralised, constituents of unpleasant odour are polymerised. Distillation by steam through specially designed fractionating columns under reduced pressure completes the purification. The heavy tailings are transferred to the crude dipentine fraction.

According to Technical Bulletins Nos. 276 and 596 of the U.S. Department of Agriculture, steam distilled turpentine consists of 98 per cent. terpene hydrocarbons, the balance is made up of terpene alcohols, ethers, etc. Alpha pinene accounts for 80 per cent. of the terpenes, the remaining 20 per cent. is divided between limonene, dipentene, terpinene, terpinolene and an array of other terpenes in very small percentages. Gum turpentine, on the other hand, consists of 95 per cent. alpha and beta pinene in the ratio 2:1. The differences in constitution have no meaning at all in the use of turpentine for paint and varnish requirements.

Dipentine

Dipentine, terpinene and terpinolene are the three most important constituents of the crude fraction boiling between 170° and 210° C. The separation, purification and utilisation of these bodies marks a further stage in the progress of the industry. In the earlier stages, technically pure dipentine was marketed, but though an excellent solvent, did not quite come up to expectations as an anti-skinning agent. Investigation of the properties of terpinene and terpinolene were undertaken, they proved to be excellent solvents and anti-skinning agents, but their tendency to polymerise ruled them out. Most "dipentines" on the market to-day are carefully balanced mixtures of these three substances. The use of "dipentine" is increasing rapidly in many industries. It has quite good wetting and dispersing properties, properties which are not always used to best advantage. It has never been put forward as the complete and absolute panacea for all skinning troubles, but intelligently used in properly formulated media, it will give a good account of itself. Paracymene, with a narrow boiling range (176° C. to 177.8° C.), is another possibility; its properties are under investigation.

Having at its command a material rich in pinene, the Wood Naval Stores industry has utilised its intimate experience and knowledge of fractional distillation technique to produce it in a technically pure form. Pinene is the logical starting point for an almost infinite number of synthesis, few of which have been put to commercial use. I will make bold to say that pinene, in the not far distant future, will become one of the basic raw materials of the organic chemical industry; pinene is to-day the essential raw material for the manufacture of synthetic camphor. Terpene-maleic anhydride resins are but one indication of the possibilities.

Among the many other hydrocarbons derived from the stumps or formed by chemical changes during processing I shall mention only diterpene. Diterpene is a yellow liquid boiling at over 300° C. Its solvent properties are closely akin to those of turpentine, but its solvent power as determined by, say, the Kauri-butanol method, is much lower. Diterpene stands apart from all other solvents because, on exposure to the atmosphere in thin films, it oxidises and polymerises to a solid resin. The loss of weight as between liquid and solid is about 1 per cent. solvent and film forming material combined. But the drying time is much too slow and the resin produced soft and tacky. Nevertheless, this most interesting substance is slowly finding employment. Diterpene is used as a plasticiser and to confer good flow properties to stoving finishes.

Pine Oil

The high boiling fraction of the crude distillate, after suitable treatment, yields "pine oil." High grade pine oil has the following approximate constitution:—

Alpha terpineol	68.5 per cent.
Menthanols	4.2 per cent.
Fenchyl alcohol	8.0 per cent.
Borneol	9.0 per cent.
Methyl chavacol	10.0 per cent.
Phenol ethers Moisture	.3 per cent.

The distillation range lies between 212° and 220° C. Pine oil is noted for its exceptional wetting properties, and is one of the best known general solvents for resins, being miscible with practically all the oils used in the paint and varnish industry. Its evaporation rate is slow. It is a very powerful germicide, non toxic and non irritant.

Deposits of copper ore have been located by the Polish State Geological Institute near Horodina on the Dniester.

Public Health Exhibition

Some Exhibits of Interest to the Chemical Industry

THIS year's Public Health Services Congress and Exhibition (Engineering and Equipment) which opened on Monday at the Royal Agricultural Hall, London, N., and concludes to-day (Saturday) was far more comprehensive in character than any of its predecessors. The opening ceremony was performed by the Rt. Hon. Walter E. Elliot, Minister of Health, and President of the Congress, Sir Frederick J. Willis, Chairman of the Congress Council, occupying the chair.

The numerous exhibits included a number of particular interest to the chemical industry. Tintometer, Ltd., displayed the all-purposes Lovibond Comparator for routine colorimetric tests; this is an improved and enlarged version of the well-known Lovibond Comparator and is designed to carry out all the tests already available for that instrument together with many fresh types of test. It has also now been made available for the quantitative estimation of toxic gases in air. A series of leaflets under the general title "Methods for the Detection of Toxic Gases in Industry," is in the course of publication by H.M. Stationery Office. The methods recommended are colorimetric, and the final evaluation of the results of the tests depends on comparison of the colour obtained with standard colour charts included in the leaflets or with standard coloured solutions. The all-purposes Lovibond Comparator interprets the colours obtained and the colour glasses have been tested and officially approved as an alternative method of comparison. The Lovibond Tintometer, with a new white light cabinet for colorimetric determinations, was another exhibit on view at this stand.

The British Fumigants Co., Ltd., were showing a range of disinfectant products which included Cefyl pine disinfectant, the Rideal-Walker coefficient of which is 4.5 due to the presence of higher terpene alcohols in the oil of pine used in its manufacture. The resistant powers of Vigorised brushing and spraying paints, manufactured by Pinchin, Johnson and Co., Ltd., were illustrated on that company's stand and examples were given of the affect of acids on ordinary paint and on Vigorised paint. The unique advantages of the paint, in that the second coat can be applied before the first is dry, are featured.

The adaptability of the safety and protective appliances manufactured by Siebe, Gorman and Co., Ltd., is illustrated on the company's stand by means of life-size dummies. Equipped with various types of respirators the figures are shown emerging without difficulty from narrow apertures, such as manholes.

One of the main problems in connection with the design of sewage works is how to prevent an excess flow going for full treatment in times of storm, and it is a subject which is dealt with at the Lea Recorder Co., Ltd.'s, stand where a working model of the company's automatic controlling apparatus for separating flows for full treatment and storm water, is on view. Instruments dealing with trade effluent measurement and measurement of water supplies and sewages are also exhibited.

George Kent, Ltd., show the Multelec *p*H recorder which is used in the treatment of sewage and trade effluents among its many industrial applications.

The I.C.I. stand demonstrates the value and versatility of chlorine as a sterilising agent. The part played by I.C.I. chemicals in the important public health field of pest control is illustrated by two exhibits: "Termex," and I.C.I. British HCN. Clensol and Noricene descaling solutions for pipelines are among the products shown by Clensol, Ltd.

The Permutit E.C.D. Equipment, which manufactures a solution of sodium hypochlorite, ideal as an antiseptic and general sterilant, is one of the exhibits on the Permutit Co.'s stand. The equipment is economical in use and the

(*Continued at foot of next column.*)

Indian Institute of Science

Some Activities During the Year 1937-1938

MUCH work of industrial value has been done in the Biochemistry section of the Indian Institute of Science, Bangalore, India, during the year 1937-38, while the other sections have made valuable contributions to scientific knowledge in the realm of pure science. A. Venkatasubban and Sreenivasaiya have effected an improvement in the preparation of bleached lac whereby it can be stored in the dry state for a considerable length of time without impairing its solubility in alcohol. Another process has been patented for the manufacture of lac paints and enamels in powder form which can be dispersed easily in suitable solvents to yield paints ready for spray or brush application.

Dr. Varadarajan has continued his work on the production of commercial glucose and the determination of the factors influencing the production of solid dextrose. T. R. Bhaskaran and S. C. Pillai have evolved a method of rapidly converting the sticky liquid molasses into a solid dry product. This paves the way for economic utilisation of the large quantities of molasses now obtained in India. Dr. Subramanyam and T. R. Bhaskaran have studied the factors that control the large-scale conversion of molasses into acid-products and their application to soils. B. S. Kolkarni and S. K. K. Jetkar have made useful investigations on the activation and clarifying properties of "Fuller's Earth." Research in the Organic Chemistry Department related to synthetic experiments in the "Pinene group" has been carried out. Work is mostly in the realm of pure science, but nevertheless of considerable commercial interest.

ACETONE AND BUTYL ALCOHOL FROM ORANGES

CONSIDERABLE chemical research activity has been manifest in Palestine recently owing to the threatened glut of Jaffa oranges and grapefruit, the production of which has increased so rapidly that markets cannot be found to absorb them all. With the object of turning the surplus to good account, experiments have for some time been conducted at the Daniel Sieff Research Institute, Rehovoth, where Dr. Chaim Weizmann, Ph.D., D.Sc., LL.D., has introduced a fermentation process for converting the sugar content of the orange peel (40 per cent. of dry weight) into acetone and butyl alcohol. Production is reported to take place at high speed and with excellent yields, and it is expected that the profitable exploitation of the orange for industrial spirit will begin at an early date.

(*Continued from preceding column.*)

hypochlorite solution is manufactured as and when required, thus assuring freshness and eliminating the use of stabilisers, which are usually added to commercial hypochlorites. The principle of the Permutit-E.C.D. equipment is the electrolysis of a brine solution; the electrolytic cell which effects this electrolysis is of special design and imparts a high proportion of available oxygen to the hypochlorite produced.

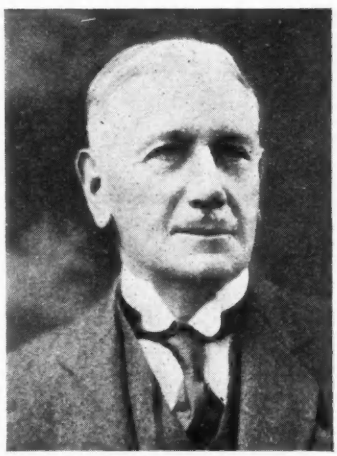
Municipal water softening by the "Basex" process is dealt with on the stand of the Paterson Engineering Co., Ltd., who have registered the name "Basex" for their particular zeolite, which is used in the base-exchange process of water softening. It is claimed that "Basex" not only has a greater softening power and lower salt consumption than any other matérial available, but that it is also the most durable of zeolites. The Paterson Chloronome for the sterilisation of water is another exhibit. In the Chloronome it is claimed that a positive and effectual barrier is interposed between the control apparatus and the water supply under treatment, and all metallic parts of the instrument are thus kept constantly dry, and free from the possibility of corrosion.

Death of Sir Walter Kent

Chairman of the Well-known Firm of Meter Manufacturers

SIR WALTER KENT, C.B.E., chairman and managing director of George Kent, Ltd., the well-known manufacturers of recording and controlling instruments, died on November 11. He was eighty years of age.

Sir Walter was educated at Tunbridge Wells and University College, London, and then entered the firm of George Kent, Ltd., which was under the control of his father, Mr. George Kent. For a century between them he and his father personally directed the policy of the business, the centenary of which was celebrated this year (see THE CHEMICAL AGE, June 25, 1938, page 505). Under his direction the company grew until it became the largest business in Great Britain concerned with this class of manufacture. He was not only instrumental in bringing together a large and efficient technical and research staff but he took a keen interest in the welfare, education and social activities of all his employees.



The late Sir Walter Kent.

In addition to his engineering interests, he was chairman of two rubber companies, president of the Luton Conservative Association and a former chairman of the Eastern Area Conservative Association. He was made C.B.E. in 1918 and knighted in 1929.

An Appreciation

MR. JOHN BENN, a director of THE CHEMICAL AGE, writes: "With the passing of Sir Walter Kent, British industry has lost one of its "Grand Old Men." Not that he gave the impression of being old; in his eightieth year, Sir Walter had the bearing of a man in his fifties, and his outlook was perhaps even younger. Those of us who attended the centenary celebrations of George Kent, Ltd., last June will always remember the breezy speech with which he welcomed his guests at the Press Luncheon, and the engaging way in which he related reminiscences of his father, Mr. George Kent, who had founded this famous business in 1838. He recalled with pride and affection the close relations that had existed between father and son, who between them had presided over the destinies of the firm for a full century. Perhaps their most famous product was the Kent knife-machine, though for many years the production of engineering equipment, particularly meters, has been their principal activity.

"During the War, Sir Walter Kent put the works at the disposal of the Government for the manufacture of munitions, and King George V personally visited Luton to inspect this factory. The death of Mr. Leigh Kent a few months after

(*Continued at foot of next column.*)

Catalysts for the Fischer-Tropsch Process

Recent Japanese Developments

From a Tokyo Correspondent

THE Fischer-Tropsch process of synthesising petrol from carbon monoxide and hydrogen is finding its way into large-scale industry in the Far East. The Mitsui Mining Co., which has acquired the rights for the system in the Far East, is building a plant capable of producing 30,000 kilolitres of petrol annually, and the South Manchurian Oil Liquefaction Engineering Co., which was founded jointly by the Mitsui Co. and the Government of Manchukuo, is also to utilise the same process in a factory to be built at Fuhsin. The latter, when fully equipped, will produce 100,000 kilolitres yearly.

The success of these enterprises, naturally, depends in a large measure upon the efficiency and economy of the catalyst employed. The two firms are not likely to use the catalyst discovered and recommended by Dr. Fischer himself, which is nickel containing oxides of manganese and aluminium as promotors and kieselguhr as carrier. But they will probably use one of those developed in this country, such as those discovered by Dr. Genitsu Kita, Professor in the Kyoto Imperial University, and by the Fuel Research Institute of the Ministry of Commerce and Industry, respectively.

Dr. Kita prepared a large range of cobalt catalysts containing copper and the oxides of thorium, uranium and manganese as promotors and kaolin or kieselguhr as carrier, and discovered that the oxides of uranium and thorium were the most efficient promotors and kieselguhr the best carrier. A grade, which was made of 80 per cent. cobalt, 10 per cent. copper, 2.5 per cent. thorium oxide, 0.5 uranium oxide and the balance kieselguhr gave the highest yield (144 c.c. of petrol from 1 cu.m. of synthesis gas). His experiment with nickel, however, was not wholly successful. He concluded that the petrol yield could not be raised, at least to such an extent that it might be compared with those of other catalysts, unless the metal was treated by complicated methods which would make its commercial application difficult.

Catalysts of nickel, cobalt, aluminium and silicon had their own advantages, yet all failed to yield a sufficiently large quantity of petrol. Finally, Dr. Kita discovered that a nickel-cobalt catalyst prepared by precipitation methods was the most efficient and economical agent for the petrol synthesis. This catalyst of 50 parts by weight of cobalt, 50 of nickel, 15 of manganese, 3 of thorium oxide, 5 of uranium oxide and 125 of kieselguhr, was reduced with hydrogen for four hours at 400° C. When the synthesis was conducted at 190° C., it produced 166 c.c. of petrol from 1 cu. m. of gas treated. A further study is to be made of the means of producing this catalyst at as low a cost as possible.

The Fuel Research Institute of the Ministry of Commerce and Industry has experimented with practically all the catalysts made of nickel, cobalt and other metals suggested by foreign and Japanese chemists. As a result Mr. Tsutsumi, reported that a nickel catalyst containing 20 per cent. manganese, 8 per cent. uranium oxide and 4 per cent. thorium oxide is the best material, yielding 168.8 c.c. of petrol per 1 cu. m. synthesis gas. The reaction is carried out at 200° C. and a gas flow of 6 litres/hour.

(*Continued from preceding column.*)

the War was a great blow, though fortunately other members of the family were in the business to carry on its control and traditions.

"While Sir Walter was a shrewd business man, his unfailing kindness and courtesy endeared him to all, especially his staff and workpeople. His presence with Lady Kent at the centenary celebrations was the happiest feature of this important event in the history of the firm."

Adjusting Moisture Content

An Exact and Rapid Large Scale Method

A LARGE-SCALE method for the exact and rapid adjustment of the moisture content of a product is described by McBride (*Chem. Met. Eng.*, 1938, *45*, 520-524). The method has been developed for increasing the water content of tobacco, and in that sphere replaces a process which took several weeks by one which can treat 135 tons of tobacco in 8 hours.

The goods to be conditioned are run into the treatment chamber on trucks, the door closed and the pressure in the chamber reduced to below that at which water boils at the prevailing temperature. This causes some of the water to boil out of the material carrying with it trapped air, and thereby opening up all the pores of the goods to free penetration by water vapour in the humidifying operation. The humidification is carried out by the injection of the desired amount of water in the form of a spray at a predetermined optimum temperature. 10 per cent. of the water is instantaneously converted to steam, while the remainder stays in suspension as a "macro-mist." The pressure is raised by the injection of the water to about a third of an atmosphere. Rapid and uniform diffusion of the water into, and absorption by, the material occurs. Should it be desired to increase the moisture content of the goods considerably, it is best to achieve this by a multiplication of the process, i.e., by repeated evacuation and injection of water, rather than by attempting to introduce all the water in one operation.

The final stage of the treatment is to bring the material to the desired final temperature, in the case of tobacco about 140° F. This is done by re-evacuating the chamber, and blowing in desuperheated steam. The evacuation assists in ensuring a uniform distribution of the steam heat in this operation, just as it ensured a uniform distribution of water in the humidification stage.

Production of Ruby Glasses

Cadmium Selenide and Alkali Sulphide Essential Constituents

SOME conclusions of interest drawn from a study of selenium-ruby glasses are reported by Loeffler (*Glass*, 1938, *15*, 396-399, 406). It has been claimed by some writers that the colour of these glasses is due to cadmium selenide entirely. This is fallacious, since this compound, massive, is black, and even in powder form is dark brown. It yields glasses which are either very dark coloured or, when the amount of selenide present is very small, brownish.

The presence of some cadmium sulphide is essential to the production of a good ruby, and the minimum amount of cadmium which should be present as sulphide is about 25 per cent. of that existing as selenide. A deficiency always leads to brownish tints. It is possible to isolate the ruby pigment by dissolving away the glass with hydrofluoric acid; it appears to be essentially a solid solution of sulphide in selenide.

Introduction of Selenium and Cadmium Selenide

Far stronger rubies can be obtained if the selenium is introduced as cadmium selenide instead of in the usual form of a mixture of cadmium sulphide and selenium. The effect is probably to be traced to a loss of selenium which can occur in the latter case, by volatilisation together with the sulphur set free in the reaction. The saving of cadmium amounts to 30-75 per cent., and of selenium to 15-66 per cent. A sulphide must be introduced; this is best done with cadmium or an alkali sulphide. Zinc sulphide may be used, but greater difficulty in striking the ruby is experienced. The most satisfactory way of introducing sulphur seems, however, to be in the form of sodium sulphocyanide, which, in virtue no doubt of its reducing action, eliminates the troubles usually met with when sulphates are present.

Chemical Carcinogenic Agents

Of Value in Causative and Curative Cancer Research

THERE was a large attendance, including representatives of the medical profession and chemical societies in the West Wales area, at the lecture on "Chemical and Carcinogenic Agents" at the Swansea University College on November 10 by Dr. J. W. Cook, F.R.S., Professor of Chemistry at the Cancer Hospital Research Institute. Dr. J. E. Coates, Professor of Chemistry, Swansea University College, occupied the chair, and in his introductory remarks expressed his gratitude to the local branch of the British Medical Association, who had brought the meeting to the notice of local medical men. Professor Cook, he said, had achieved world-wide fame for his researches on chemical substances, especially hydrocarbons, which have the power of inducing cancer.

Professor Cook prefaced his lecture by stating that this was his first visit to Wales, and he was very appreciative of the opportunity which had been extended to him to deliver his lecture. Cancer, from both the causative and curative sides, had always been shrouded in mystery, and experiments on both sides of the question had been carried out now for many years all over the world. One of the most fruitful sources for this research work had been cancer produced by synthetic substances such as certain hydrocarbons. Cancer in the human body was caused by several agencies, such as the industrial activities of the individual, and various hereditary factors, but cancers had been produced on small animals by means of the application of carcinogenic agents, and it had also been found that cancerous warts formed by this method gave rise to malignant cancer in domestic rabbits. Scarlet Red Dye had been found to be a source of cancer in this way, as also had Butter Yellow, and the use of this latter substance as a food dye had now been done away with. A form of cancer prevalent some years ago had been known as "Chimney-sweeps cancer," and this was due to contact of the skin with soot. Operatives working with various coal products, such as tar, etc., had been found to suffer from various forms of cancerous tumours. In the cotton spinning districts of Lancashire the operatives also suffered in numbers from a form of cancer know as "Mule-spinner's cancer," the cause of which had been traced to the lubricating oils used for the machines. In the warm atmosphere of the cotton mills, operatives worked in various states of undress, and as a consequence the oil, which had been proved to be a carcinogenic agent, could reach all parts of the body.

In the case of the coal tar worker the source of infection had been found to be 1:2-benzpyrene, and various experiments had been carried out with this substance. Most carcinogenic agents showed some fluorescence, and in the case of benzpyrene this had been found to consist of three bands. Synthetic benzpyrene prepared in the laboratory also showed a very similar fluorescence. Benzpyrene had been applied to the backs of small animals, and traces of fluorescence had afterwards been found in the animals' bile and liver cells. Professor Cook then detailed several experiments which had been carried out upon small animals with various by-products of pyrene and benzpyrene, including dibenzanthracene, which was mildly carcinogenic; methylcholanthrene; cholanthrene, which was found to show fluorescence bands differing from those shown by benzpyrene in that they were further up the scale towards the direction of the ultra-violet section; dimethylbenzanthracene; etc. In these experiments, different forms of cancerous warts and tumours had been produced, and an important aspect of the work was that by means of chemical treatment the carcinogenic activities of these substances had been minimised, and in some cases completely eliminated.

At the conclusion of the lecture a vote of thanks to Professor Cook was proposed by Dr. Hinkel, of the Chemistry Department, Swansea University College, and seconded by Mr. T. I. Watkins.

Mercury Diffusion Pumps

A New Range to Meet Almost all Requirements

A RANGE of mercury diffusion pumps and accessories to cover almost all requirements from small scale laboratory work to large industrial processes where the lowest possible pressures and highest pumping speeds are required, has now been made available by W. Edwards and Co.

Mercury diffusion pumps provide a most satisfactory means of reaching very low pressures and even the smallest sizes are said to have speeds at low pressures much greater than can be obtained by rotary pumps. Furthermore, they are extremely robust, have no moving parts to wear and can be dismantled for cleaning with a minimum of trouble. Since the diffusion principle can only be employed efficiently at pressures below 10^{-1} mm.Hg. approximately, these pumps must be used in conjunction with a suitable "backing" or "fore-vacuum" pump. This pump will normally be of the single stage rotary oil-immersed type, having an ultimate vacuum of 10^{-4} to 10^{-5} mm.Hg. In order that the high speeds of the diffusion pumps may be fully utilised, it is essential that connection to the apparatus being exhausted should be as short and wide as possible. For this reason all pumps are provided with standard flange fittings on the high vacuum side so that the pump may be bolted directly to the apparatus where this is of metal construction. If a glass tube connection must be used, this may have a standard conical joint and be used in conjunction with adaptors, or the end of the tube may be flanged and joined to the flange of the pump with special vacuum wax. All the pumps are guaranteed to produce an ultimate vacuum of 10^{-6} mm.Hg.

One of the new ranges of mercury diffusion pumps put on the market by W. Edwards & Co. It comprises a high-speed pump backed by a small pump of new design. The whole is on a stand enclosing an electric heater.

or below, but it must be remembered that the total pressure obtainable is limited by the vapour pressure of the working fluid, *i.e.*, mercury, at the cooling water temperaure. Should total pressures below this be required it is necessary to interpose a cooling trap between the pump and system to be exhausted. A range of traps suitable for liquid air or CO_2 to work with any of the pumps is made by the company.

If the diffusion pump is to operate at maximum efficiency, it is essential that a "backing" pump shall be chosen with characteristics which are suitable for the proposed work.

All diffusion pumps need a certain heat input to vaporise the mercury and a flow of cooling liquid through the condensing jacket. Electric heating is most desirable, but for laboratory purposes the smaller types may be gas heated if desired. The company's standard electric heaters are clamped to the pump boiler by two bolts, thus ensuring good

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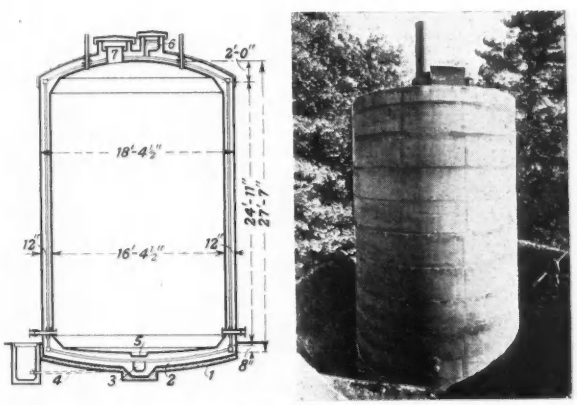
Concrete Petrol Storage Tanks

"Water Wall" Supersedes Metal Lining

A SYSTEM of building concrete tanks without any metal lining, suitable for petrol storage in refineries, etc., has been developed by La Paroi Hydraulique, of Paris. Construction is based on the principle, known for some time but not hitherto put into practice, that concrete is petrol tight when saturated with water. The possibility of building tanks without metal lining both under or above ground obviously simplifies construction.

In construction of the tank, hollow porous tiles of special design are embedded in the concrete wall so as to form a continuous layer. The ducts in these tiles are interconnected



so that water poured into one duct is circulated throughout the layer of tiles, forming a sheet of water around the whole tank. Water seeps through the whole thickness of the concrete wall of the tank, saturating it and rendering the penetration of petrol into the concrete impossible. The inner surface of the tank wall being normally wet, the petrol cannot even touch the wall.

In building, the concrete base (1) is first laid down, then the lower layer (2) of the concrete floor. In the centre of the lower layer of the floor a cup-shaped depression (3), connected by a pipe (4) to the outside of the tank, is provided. This serves to drain off the water from the tank should this be necessary for repair work, or to circulate hot water through the tank wall in cold weather. A small cup-shaped depression (5) collects the last drops of petrol when the tank is emptied. The walls of the tank are built by raising the usual forms and inserting reinforcing rods and cross-ties with the tiles between them. When concrete is poured into the form, a solid wall is obtained.

The construction of the top of the tank is similar to that used in the floor. Instead of the cup used to drain off the water, a reservoir (6) is on the roof of the tank. This is not very large, having a capacity of only a few gallons. It is connected to the ducts in the tiles so that by pouring water into it the whole system of ducts covering the tank walls, roof and floor, can be flooded. A manhole (7) giving access to the tank is also provided.

(*Continued from preceding column.*)

thermal contact and making replacement simple and rapid.

While the majority of operations and processes requiring high speed pumps are only concerned with the partial pressures of air or other gas attained, there are certain cases in which the total pressure of gas and vapour is of importance. As already stated the total pressure will be determined by the vapour pressure of the mercury and in such cases it will be necessary to trap the vapour which tends to diffuse back from the pumps into the exhausted system. W. Edwards and Co. have developed an all-steel trap, which is designed to bolt directly to the high vacuum connection of the pump

British Overseas Chemical Trade in October

ACCORDING to the Board of Trade returns for the month ended October 31, 1938, imports of chemicals, drugs, dyes and colours were valued at £1,819,936 as compared with £1,294,356 for October, 1937, an increase of £525,580. Exports were valued at £2,345,321 as compared with £2,095,650, an increase of £249,671. Re-exports were valued at £63,581.

Imports

	Quantities. October 31, 1937.	Quantities. October 31, 1938.	Value. October 31, 1937.	Value. October 31, 1938.
Acids—				
Acetic .. .. cwt.	10,283	14,216	11,905	18,241
Boric (boracic) .. ,,	2,815	2,861	2,977	3,340
Citric .. .. ,,	1,246	1,285	4,956	5,194
Tartaric .. ,,	1,078	2,960	4,686	13,806
All other sorts .. value	—	—	9,193	13,231
Borax .. .. cwt.	8,944	9,661	6,571	5,842
Calcium carbide .. ,,	134,427	197,976	73,252	93,247
Fertilisers, manufactured—				
Superphosphate of lime tons	—	1,450	—	2,992
All other descriptions ,,	2,450	1,939	14,908	10,152
Potassium compounds—				
Caustic and lyes cwt.	10,579	17,128	11,716	21,776
Chloride (muriate) ,,	274,773	276,190	92,709	85,861
Kainite and other potassium fertiliser salts cwt.	194,300	168,410	35,929	30,464
Nitrate (saltpetre) ,,	7,113	6,837	5,502	5,721
Sulphate .. ,,	153,419	205,200	70,384	95,353
All other compounds ,,	7,984	21,794	10,199	27,870
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	661	230	389	147
Ichromate and bichromate .. .. cwt.	903	1,094	1,067	1,292
Cyanide .. ,,	167	704	497	1,812
Nitrate .. .. ,,	40,280	80,439	9,438	19,928
All other compounds ,,	21,652	28,475	20,644	20,356
Chemical manufactures value	—	—	382,478	688,492

	Quantities. October 31, 1937.	Quantities. October 31, 1938.	Value. October 31, 1937.	Value. October 31, 1938.
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	148,784	186,325	12,740	16,784
Medicinal oils .. cwt.	3,296	6,767	9,176	15,958
Proprietary medicines value	—	—	96,997	119,502
All other sorts .. ,,	—	—	50,375	84,377
Finished dye-stuffs obtained from coal tar cwt.	3,239	4,056	100,702	129,425
Extracts for dyeing ,,	4,821	2,116	12,254	3,849
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	24,429	34,068	18,263	26,659
Quebracho .. ,,	23,061	26,100	22,070	24,291
All other sorts .. ,,	43,294	50,507	34,284	44,720
All other dyes and dye-stuffs cwt.	1,597	607	23,054	15,920
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	4,759	7,610	7,644	10,413
Lithopone .. ,,	23,174	35,053	14,235	21,577
Ochres and earth colours cwt.	29,187	32,991	11,173	12,197
Bronze powders and other metallic pigments .. cwt.	2,170	2,123	16,544	15,886
Carbon blacks .. ,,	39,625	43,264	54,692	60,130
Other pigments and extenders, dry .. cwt.	40,916	71,298	11,524	18,257
All other descriptions ,,	15,051	17,428	29,229	34,874
Total .. .. value	—	—	1,294,356	1,819,936

Exports

Acids—				
Citric .. .. cwt.	2,413	5,362	11,733	23,983
All other sorts .. value	—	—	29,049	30,099
Aluminium compounds tons	2,877	2,860	23,589	20,506
Ammonium compounds—				
Sulphate .. tons	21,781	26,080	140,080	170,966
All other sorts .. ,,	621	6,928	12,525	78,949
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	76,945	56,224	19,368	15,447
All other sorts .. ,,	9,247	9,424	18,948	23,631
Coal tar products—				
Cresylic acid .. galls.	175,503	257,318	35,702	29,905
Tar oil, creosote oil ,,	4,488,647	4,916,884	116,997	118,618
All other sorts .. value	—	—	22,285	15,781
Copper, sulphate of tons	1,022	1,282	19,803	18,013
Disinfectants, insecticides, etc. .. .. cwt.	43,928	46,570	89,266	101,927
Fertilisers, manufactured tons	28,053	12,094	82,686	53,256
Glycerine .. .. cwt.	12,861	8,142	44,149	27,713
Lead compounds .. ,,	14,303	21,533	23,314	30,085
Magnesium compounds tons	501	496	11,640	12,854
Potassium compounds cwt.	3,946	8,426	10,180	16,450
Salt (sodium chloride) tons	25,938	29,247	64,345	77,808
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	480,778	378,759	97,585	91,382
Caustic .. .. cwt.	190,079	207,645	94,661	113,343
Nitrate .. .. ,,	658	2,610	289	1,029
Sulphate, including salt-cake .. .. cwt.	87,199	130,266	8,533	17,143
All other sorts .. ,,	73,060	98,695	62,129	97,818
Chemical manufactures and products .. value	—	—	27,892	46,310
Drugs, medicines and medicinal preparations cwt.	—	—	12,651	15,066

Zinc oxide .. tons	1,062	1,940	24,841	34,020
All other descriptions value	—	—	224,315	253,588
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	224,521	69,090	25,911	8,834
Proprietary medicines value	—	—	122,031	135,072
All other descriptions value	—	—	147,350	179,572
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained form coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,818	527	11,938	4,082
Other sorts .. ,,	7,780	10,331	100,043	155,839
Extracts for tanning (solid or liquid) cwt.	19,900	19,217	16,826	17,324
All other descriptions ,,	1,748	2,038	13,979	9,564
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	11,116	12,041	10,531	12,110
Other descriptions ,,	32,096	28,006	47,032	46,865
White lead .. ,,	2,397	6,306	5,554	12,925
Ships' bottom compositions cwt.	4,564	2,855	12,935	9,507
Paints and painters' enamels .. .. cwt.	49,935	41,254	145,975	188,422
Varnish and lacquer (clear) .. .. galls.	79,673	78,422	30,892	30,747
Printers' ink .. cwt.	4,422	5,547	23,254	27,735
All other descriptions ,,	49,230	52,559	93,387	102,427
Total .. .. value	—	—	2,095,650	2,345,321

Re-Exports

Dyes and dye-stuffs and extracts for tanning cwt.	623	219	4,262	1,006
Painters' and printers' colours and materials cwt.	685	1,022	1,152	1,199
Total .. .. value	—	—	45957	63.581

Anglo-U.S. Trade Treaty

A Tribute to Sir Owen Chalkley

(Specially contributed by Paul Wooton, Washington Correspondent, McGraw-Hill Publications).

MUCH credit for the successful outcome of the Anglo-American trade agreement is due to a modest, hard-working man who would be the last to attach importance to the part he has played in the negotiations. I refer to Sir Owen Chalkley, commercial counsellor of the British Embassy in Washington. Long before the public announcement last November, recognising that the opening of negotiations would in all probability be only a matter of time, Sir Owen foresightedly began getting together the data that would be required. He was well qualified for the task. His studies of American and British commerce, industry and agriculture through the years had been so thorough that he knew exactly where to start. His knowledge of the effects of the U.S. emergency tariff of 1922, of the Smoot-Hawley tariff of 1930, and of the tariff amendment or trade agreements act of 1934 stood him in good stead. He was well aware where the greater difficulties would arise, and knew the arguments that would be raised against particular reductions and concessions. Facts and figures concerning those situations were marshalled and were in readiness when the negotiations actually began.

Sir Owen Chalkley's View of Agreement's Benefits

Sir Owen, however, has a deeper interest in the agreement than that of a fact finder and a counsellor. He believes the trade agreement will operate to the benefit of both countries and the whole world. There are two primary reasons which he cites to support this contention. The United States normally absorbs such a preponderant share of the primary commodities and gold, of which British Empire countries are large producers, that the prosperity of those countries, which is reflected in the United Kingdom itself, has come to vary in large measure with the purchasing and consuming capacity of the United States, that is to say with conditions of prosperity or depression in the United States. At the same time the United States produces far in excess of its domestic needs and depends for stable prosperity on exporting many agricultural and manufactured products for which the United Kingdom is by far the largest market. It is therefore in both the American and British interest to facilitate the flow of these commodities into world trade.

Another reason is that forty per cent. of the entire foreign trade of the world is done by the United States and the countries comprising the British Empire. Sir Owen Chalkley has placed emphasis on the narrowing portion of the world in which the remaining sixty per cent. is uncontrolled and capable of expansion. To the countries where exports and imports are monopolised by governments or by permit only, there must be added the war areas in the Orient and in Spain. Further restrictions come from exchange controls and quotas, bilateral balancing, and policies of economic nationalism.

Effects on World Trade

The new agreement, which should result in the expansion of trade and prosperity in these two powerful economic units, cannot fail to have beneficial effects on world trade generally, and may prove an attractive force in arresting and reversing the drift of other countries toward controlled and restrictive systems of foreign trade, from which those units have been the chief sufferers. In the absence of an agreement between the English-speaking peoples, the world might have been forced further into bilateral balancing of trade, with control of imports and exports and a degree of regimentation never known before. In that case, a lower standard of living would be inevitable, to say nothing of increased international friction that would result from the conduct of trade on such a basis. Hence the world-wide importance of the treaty now happily concluded between our two countries.

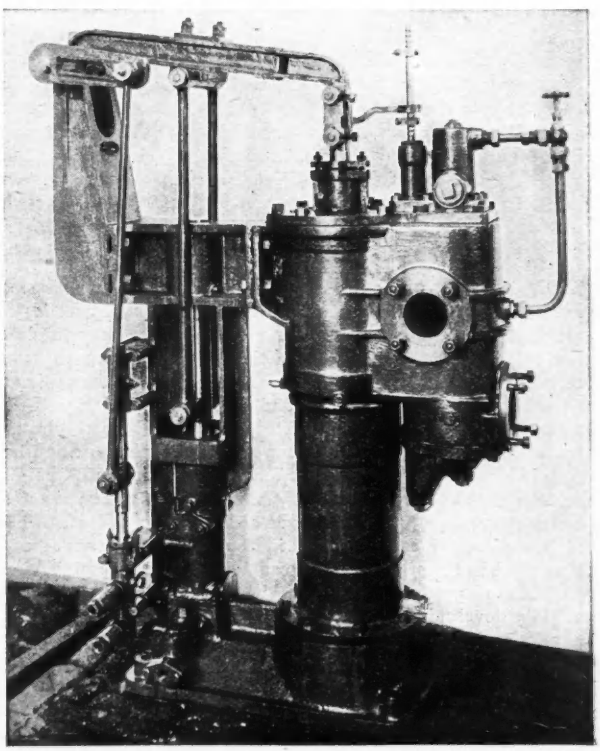
New Type of Photographic Film

Light-sensitive Dye Incorporated with Regenerated Cellulose Base

THE stability of a new type of photographic film has been investigated by Sookne and Weber (*Bureau of Standards, Journal of Research,* 1938, *21,* 347-353). The material investigated has a base of regenerated cellulose, incorporated in which is a light sensitive dye, which performs the same function as the emulsion in the ordinary photographic film. The materials has a thickness of 0.002 in., and is plasticised with glycerine to increase its flexibility.

Photographically, this type of film has a considerable interest for record purposes, in that it is grainless, yields an image of high contrast, and one that is not readily damaged by scratching. The base is slow burning, and only one-third as thick as the emulsion type of negative base. The film is, as yet, only of interest for position work—it is much too slow for negatives.

The stability of the base was measured by observing the changes in various properties under the influence of accelerated ageing. The chief changes studied were those in weight, flexibility, acidity, and copper number. The tests indicate that the new material, the trade name of which is " Ozophane," is definitely less stable mechanically than cellulose acetate film —the loss in flexibility, and the increase in degradation of the cellulose as shown by the increase in acidity and copper number, were all greater than in the case of the emulsion films. The stability is about equal to that of sulphite wood fibre paper, which suggests a considerable field of application for " Ozophane " in making photostat copies for reading room records, which would be worn out by ordinary wear and tear within the period in which the failure of mechanical properties of the base would render the record useless. A life of about 25 years may be expected.



An Hydrautomat made by Glenfield and Kennedy Ltd. This is frequently used for mixing chemicals for water softening; a corrosion resisting nickel bronze bush is used on the valve controlling the flow of chemicals.

Recent Trade Literature

The latest edition of the plant units catalogue issued by W. J. FRASER AND CO., LTD., describes and illustrates a number of examples of plant designed and manufactured by the company. The catalogue is divided into sections devoted to distillation, autoclaves, mixing, evaporation, extraction and drying.

THE BRITANNIA LEAD CO., LTD., have for some years put on the market a grade of lead of high purity which passed the tests and conformed to all the requirements of British Standard Specification No. 334-1934 for Chemical Lead, Type A. The company are now introducing a second grade of lead which, according to a booklet recently issued, is characterised by improved creep and corrosion resistance, of the same high degree of purity, but modified by the incorporation of a carefully controlled amount of copper. This lead passes all the tests and requirements of the British Standard Specification for Chemical Lead, Type B.

THE BRITISH DRUG HOUSES, LTD., have issued the fifth edition of "*p*H Values: What They Are and How to Determine Them," which is an explanation of the theory and significance of *p*H values, by Mr. T. Tusting Cocking, F.I.C. In the fifth edition the booklet is increased from 24 to 32 pages: it now contains an account of the use of *p*H in the titration of acids and alkalies, and a chart of indicators and hydrogen ion concentration data has been included, together with titration curves for strong and weak acids. The company will be pleased to send a copy of the new edition on request to any readers to whom the subject of *p*H values is of interest.

"Pigment Dyestuffs and Toners," a recent publication of the I.C.I. DYESTUFFS GROUP, illustrates products of interest to manufacturers of paints and nitrocellulose lacquers, distempers, printing inks, wallpapers, linoleum, leather cloth and book cloth, cosmetics and artists' colours. The colours shown are all pigment dyestuffs or toners and show exceptional tinctorial value in reduced shades. The powder brands possess a softness of texture which facilitates their incorporation into the process medium. All the Monalite colours, with the exception of Monolite Fast Black B.S., are also offered as paste brands in which the colour is present in a highly dispersed state, a condition which is difficult to obtain by the use of dry powders. I.C.I. have also issued a pattern card illustrating a selection of their Thionol, diazotisable direct and Brenthol dyestuffs on loose cotton.

The latest catalogue published by MANESTY MACHINES, LTD., describes the newest types of tablet compressing machines and automatic water stills. In the past, practically all the tablets produced were for medicinal use, but nowadays not only has the output of medicinal tablets increased enormously, but many other industries have found the convenience of tablet form. Lemonade and other fruit drink tablets, soup cubes, bath tablets, refractory insulator beads, solenoid cores, laundry blues and yellows, catalyst tablets, naphthalene balls and rings, cocoa, tea, coffee and dried milk tablets, white shoe cleaner and carpet cleaner blocks are only a few of the many types of tablets made on Manesty machines. The standard machines, described in the catalogue, range from a small hand-operated model to a large rotary type machine, capable of producing 1,500 tablets per minute. For the rapidly developing plastics industry, Manesty Machines, Ltd., produce preforming presses which produces pellets of accurate weight ready for charging into moulds. The Manesty drug mills and oscillating granulators are also used for breaking down rejected pellets and moulding "flash." An interesting use for the oscillating granulator is the increasing of the bulk density of light moulding powders. As regards Manesty automatic water stills, eleven models are available for heating by gas, electricity, steam or oil. Outputs vary from three pints to fifty gallons distilled water per hour.

COMPANY MEETING.

Beechams Pills Limited

Benefits of Eno Acquisition

AN extraordinary general meeting of Beechams Pills Limited was held on Thursday, November 10, at Hotel Victoria, London, W.C., to consider a resolution increasing the capital of the company.

Mr. Philip E. Hill (the chairman), who presided, said: The purpose of to-day's meeting is to increase the capital of this company by the creation of 4,000,000 deferred shares of 2s. 6d. each of which 2,500,000 are required for the purpose of exchange for the 4,000,000 5s. ordinary shares of Eno Proprietaries, Ltd. The remaining 1,500,000 deferred shares will remain unissued, but will be available should any fresh developments arise. Your directors have no intention of issuing these shares at present. My colleagues and I are very satisfied with the terms of the acquisition of Enos and I am confident that we shall benefit materially through Enos connections overseas and also from the economies which we are now effecting through the close working associations now being established. The immediate benefit of the transaction will be considerable and the ultimate result should satisfy us all.

I should like to take advantage of this opportunity to say something with regard to the current year's trading. We could not, of course, expect entirely to escape the inevitable effect of the crisis upon the country's trade, particularly overseas, but we have suffered probably less than the majority of traders. Business is now definitely on the upgrade and we shall, I am sure, all be satisfied with the result of the year's trading and the dividend you will receive when the company's financial year ends. Talking of dividends, you will, of course, receive your second interim dividend in time to do your Christmas shopping.

The resolution was unanimously approved and the proceedings terminated with a hearty vote of thanks to the chairman.

South African News

Export of Naphthalene—Perfumery Industry's Progress

THE fact that Germany some time ago stopped the export of naphthalene has had the effect of stimulating the South African export of this commodity. Iscor, Pretoria, is now exporting naphthalene to America, where it is used in the manufacture of artificial resins. For years now large quantities of this have been produced by Iscor, but there has not always been a ready market. Much of this compressed naphthalene is being used to protect South African wool, hides and skins.

The South African perfumery industry has been making satisfactory progress, largely as a result of the extensive advertising campaign in which it indulged. Increased attention is being given to developing the export business in the Far East, but it may be some years before any startling advances are recorded. The local sales of these products are improving, but there has been no falling off in the demand for famous varieties of British and Continental perfume and toilet waters, and during the last few years this trade has steadily increased.

Fruit canning statistics which have just been issued by the South African Food Canners' Council, show how far South Africa has lagged behind the United States, Australia and Canada. In 1937 the total production of all varieties of canned fruits in South Africa was 291,224 cases, against 229,454 in 1931. The American production, on the other hand, increased from 41,366,919 cases in 1931 to 46,000,000 in 1937, and the Australian production from 1,061,000 in 1931 to 2,586,000 in 1937.

Personal Notes

DR. T. S. WHEELER, principal of the Royal Institute of Science, Bombay, has left India and will shortly take up his new appointment as State Chemist, Eire.

MR. EDWARD WILLIAM BARNSLEY, head of Meredith and Co., varnish, paint and colour manufacturers left estate valued at £46,606 (net personalty £45,518).

MR. H. JOYNES, the new Mayor of Stafford, has spent the whole of his working life with Chance and Hunt, Ltd. (Imperial Chemical Industries, Ltd.), and for some time he has been local manger.

A recommendation by the Council of the Royal Society for the award of one of the two Royal medals for the current year to DR. FRANCIS WILIAM ASTON for his discovery of the isotopes of non-radio-active elements has received the approval of H.M. the King.

MR. WILLIAM BLACK, managing director of Charlestown Lime Works Co., Ltd., is standing as a candidate for the Charlestown Division of Fife County Council. He has for long been a prominent figure in the lime trade, and over 30 years ago was appointed manager of Charlestown lime works.

SIR WILLIAM BRAGG has been recommended by the Council of the Royal Society for election as president at the anniversary meeting on November 30. PROFESSOR A. C. G. EGERTON has been recommended for election as joint secretary, and among those recommended for election to the Council are: PROFESSOR C. K. INGOLD, DR. F. L. PYMAN, PROFESSOR W. W. C. TOPLEY and PROFESSOR R. WHYTLAW-GRAY.

PROFESSOR ENRICO FERMI, of Rome, has been awarded the 1938 Nobel Prize for Physics by the Swedish Academy of Science for having proved the existence of new radio-active elements produced by bombardment with neutrons, and his discovery in this connection of nuclear reactions produced by slow neutrons. Fermi and his associates have been able to produce radio-activity in most elements, including the heaviest, as a result of his discovery of the great explosive power of slow neutrons.

OBITUARY

MR. WILLIAM E. KAY, formerly chief chemist of the Calico Printers' Association and one of the first Vice-Presidents of the British Association of Chemists, died at Higher Broughton, Manchester, last week, at the age of 83.

ANNUAL MEETING OF THE LONDON SECTION OF THE INSTITUTE OF CHEMISTRY

THE annual general meeting of the London and South Eastern Counties Section of the Institute of Chemistry was held on Wednesday, at the Palace Hotel, W.C.1. The following officers were elected for the session 1938-1939:—Chairman, Dr. E. B. Hughes; Vice-chairmen, Mr. F. G. Edmed and Mr. R. F. Innes; Hon. Treasurer, Mr. C. A. Adams; and Hon. Secretary, Mr. D. M. Freeland. The following members of the committee were re-elected:—District Member of Council, Mr. J. R. Nicholls (until March, 1939); Fellows, Mr. C. T. Abell, Dr. H. Baines, Dr. L. E. Campbell, Mr. R. C. Chirnside, Mr. R. L. Collett, Dr. J. Grant, Mr. E. M. Hawkins, Mr. A. S. Houghton, Mr. G. A. Stokes and Mr. H. A. Williams. Associates, Dr. A. Batley, Mr. J. G. Maltby, Dr. G. L. Riddell and Mr. S. Stevens. The following were elected to fill the vacancies on the committee, Fellows, Mr. E. Q. Laws and Mr. W. O. R. Wynn; Associates, Dr. M. P. Balfe and Mr. D. J. Saxby.

The annual report of the committee for the session, November 1937-October, 1938, presented at the meeting, showed that the membership of the section had increased by 5 during the year, giving a total of 2,669.

A smoking concert was held following the business of the meeting.

Iron Phosphides

Determination of Conditions Necessary to their Formation

THE conditions necessary for the formation of all the known phosphides of iron by electrolysis have been determined by Chêne (*Comptes Rendus*, 1938, *207*, 571-573). The various phosphides were formed cathodically in a bath composed of sodium phosphate and ferric oxide, together with sodium fluoride as a means of increasing the conductance. The electrodes were both of carbon.

Fe_2P was obtained by electrolysis of 1 mol. of sodium metaphosphate, $\frac{1}{4}$ mol. of ferric oxide, and $\frac{1}{4}$ mol. of sodium fluoride, at 850° C. If the amount of ferric oxide be reduced, the conductance increases and mixtures of Fe_2P and FeP are obtained. Pure FeP results from a bath containing only 1/16th mol. of ferric oxide at 750-900°. When sodium pyrophosphate is used, products containing Fe_3P may be obtained. Thus with a bath of the composition 1 mol. of sodium pyrophosphate, $\frac{1}{8}$ mol. ferric oxide, and $\frac{1}{4}$ mol. fluoride, pure Fe_3P is obtained at 850°.

Finally, FeP_2 results when the bath is made up by dissolving phosphorus pentoxide in metaphosphate, together with ferric oxide. Thus a mixture of 2 mols. metaphosphate, 1 mol. pentoxide, and 1/20th mol. of ferric oxide yields pure FeP_2 at 550°. No fluoride is here necessary. If the amount of ferric oxide is increased, the product contains FeP as well as FeP_2, and fluoride must be added to increase the conductance. The phosphides collect round the cathode and can be detached by treatment with dilute hydrochloric acid. Those the compositions of which indicated them to be a mixture of two compounds were found in general to be solid solutions.

Foreign Chemical Notes

Japan

PRODUCTION OF GLYPTAL RESIN has been started by the Nippon Paint K.K.

Italy

MOLASSES ARE THE CHIEF RAW MATERIAL in the butyl alcohol-acetone fermentation plant of the Distillerie Italiane S.A. at Savona, which it is reported will shortly satisfy the entire home demand for butyl alcohol.

Roumania

REGISTERED IN BUCHAREST WITH A CAPITAL OF 10 MILLION LEI, largely subscribed by United States interests, the Industria Romana Mecanica si Chimica will engage in the manufacture of chemical products as part of its activities.

Manchukuo

THE MANCHURIAN SODA COMPANY is proceeding with the immediate erection of three soda factories, the largest of which will be located at Kanjun on the Mukden-Hsinking railway route and will possess an annual output capacity of 5,000 tons.

France

EXPERIMENTS HAVE BEEN PROCEEDING FOR SOME TIME AT CANNES with a view to exploitation of the vast quantities of seaweed washed up on the Mediterranean coast. Analysis shows the presence of 18 per cent. calcium oxide, 8 per cent. sodium oxide, 1.5 per cent. iodine, 1.5 per cent. phosphoric acid and smaller proportions of such organic compounds as fucoidin, algin and mannitol.

LIMONITE (BROWN IRON ORE), OF WHICH EXTENSIVE DEPOSITS EXIST NEAR MARE, in the Department of Herault, is now being used extensively for treating soil in regions where trees are especially attacked by chlorosis owing to the high limestone content of the soil. Apart from iron oxide, the limonite in question contains minor proportions of manganese and magnesium which play a part in counteracting yellowing of leaves.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PRODUCTION OF RESINOUS RUBBER TRANSFORMATION PRODUCTS.—Albert Products, Ltd. (Germany, Nov. 11, '37.) 32412.

MANUFACTURE OF WATER-SOLUBLE UREA-FORMALDEHYDE-POLYHYDRIC ALCOHOL CONDENSATION PRODUCTS.—Beck, Koller and Co. (England), Ltd. 32565.

COMBINING ELEMENTARY NITROGEN WITH HYDROGEN.—R. Bondonneau, and C. Scal. 32580.

FLUORESCENT MATERIAL.—British Thomson-Houston Co., Ltd. (United States, Nov. 9, '37.) 32384.

MANUFACTURE OF FLUORESCENT MATERIALS.—British Thomson-Houston Co., Ltd., J. T. Anderson, and R. S. Wells. 32095.

LUMINESCENT POWDERS, ETC.—British Thomson-Houston Co., Ltd., J. T. Anderson, and R. S. Wells. 32239.

Complete Specifications Open to Public Inspection

METHOD OF TREATING SEAWEED for the recovery and/or the production of useful products therefrom.—T. Dillon, D. T. Flood, V. C. Barry, and P. O'Muineacain. May 5, 1937. 1892/38.

METHOD OF PREPARING MERCAPTO ARYL THIAZOLES.—Wingfoot Corporation. May 5, 1937. 3525/38.

TREATMENT OF RIGID GOODS with volatile organic solvents and apparatus therefor.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie. May 4, 1937. 72223/38

MANUFACTURE OF RUBBER COMPOSITIONS.—Standard Oil Development Co. May 5, 1937. 10067/38.

PROCESS FOR IMPROVING THE PROPERTIES OF RESIN THREADS or the like.—I. G. Farbenindustrie. May 5, 1937. 10249/38.

PREPARING ALKYLATED AROMATIC ETHER HALIDES.—Rohm and Haas Co. May 3, 1937. 10771/38.

ALLOY STEEL.—Sandvikens Jernverks Aktiebolag. May 3, 1937. 12368/38.

METHOD OF MAKING ARTICLES OF HARD METAL ALLOY.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 5, 1937. 13055/38.

METHOD OF MAKING HARD METAL ALLOYS and articles made therefrom.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 5, 1937. 13056/38.

NITROGENOUS ARTIFICIAL FIBRE.—G. Donagemma, P. Donagemma, and Snia-Viscosa Soc. Nazionale Industria Applicazoni Viscosa. May 3, 1937. 13103/38.

CATALYSTS and processes of preparing and using the same.—B. Malishev. May 3, 1937. 13146/38.

METHOD OF REMOVING WAX from fluid hydrocarbons.—Aktiebolaget Separator-Nobel. May 3, 1937. 13152/38.

DECARBONISATION OF CARBON-CONTAINING METALS or alloys.—I. Rennerfelt, and B. M. S. Kalling. May 5, 1937. 13319/38.

MANUFACTURE OF COMPOUNDS OF THE AETIOCHOLANIC ACID SERIES. Soc. of Chemical Industry in Basle. May 5, 1937. 13422/38.

PROCESS FOR THE MANUFACTURE OF INSECTICIDES and fungicides. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 4, 1937. 13212/38.

MANUFACTURE OF IMIDAZOLINES SUBSTITUTED IN 2-POSITION.—Soc. of Chemical Industry in Basle. May 7, 1937. 13424/38.

RENDERING OF IRON OR STEEL ARTICLES rich in chromium.—K. Daeves, and G. Becker. May 5, 1937. 13477/38.

LUBRICANTS AND THEIR MANUFACTURE.—E. I. du Pont de Nemours and Co. May 6, 1937. 13630/38.

PRODUCTION OF ETHERS.—Consortium Fur Elektrochemische Industrie Ges. May 7, 1937. 13657/38.

METHOD OF FACILITATING PHYSICAL OR CHEMICAL REACTION between gases and solids, liquids, or other gases.—J. E. Nyrop. May 7, 1937. 13782/38.

MANUFACTURE OF MERCAPTALS AND MERCAPTOLS.—Deutsche Hydrierwerke, A.-G. May 7, 1937. 13816/38.

MANUFACTURE OF N:N-DIALKYLDIPYRAZOLANTHRONYLS.—Soc. of Chemical Industry in Basle. July 30, 1936. 31717/38.

GLUTAMIC ACID RECOVERY from solutions.—Standard Brands, Inc. Oct. 15, 1936. 32028/38.

Specifications Accepted with Date of Application

POLYMERISATION OF HALOGEN BUTADIENES.—W. W. Triggs (E. I. du Pont de Nemours and Co.). Jan. 25, 1937. (Convention date not granted.) 494,752.

EXTRACTION OF BUTIMINOUS OR BROWN COAL and like solid carbonaceous materials with solvents at high temperatures.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 1, 1937. 494,834.

RENDERING TEXTILES WATER-REPELLENT.—Farberei-A.-G., Vorm. E. Stolte Nachfolger and W. Missy. Dec. 8, 1936. 494,761.

MANUFACTURE OF VINYL POLYMERISATION PRODUCTS.—Distillers Co., Ltd., H. M. Stanley, and J. B. Dymock. April 1, 1937. (Samples furnished.) 495,023.

TREATMENT OF CELLULOSIC MATERIALS.—J. G. Evans, H. A. Piggott, C. E. Salkeld, R. J. W. Reynolds, E. E. Walker, C. S. Woolvin, and Imperial Chemical Industries, Ltd. April 2, 1937. 495,025.

PROCESS FOR THE MANUFACTURE OF VAT DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) April 2, 1937. (Samples furnished.) 494,904.

REMOVING AMMONIA FROM GASES.—G. W. Johnson (I. G. Farbenindustrie.) April 3, 1937. 495,026.

DECOMPOSITION OF ORES containing tungsten and the like metals. Staatl Sachsische Huttenund Blaufarbenwerke. June 6, 1936. 494,947.

COMPOSITION OF MATERIALS containing silicon or metallic silicon alloy which composition is fired.—M. Hauser. May 2, 1936. 495,027.

ALUMINIUM ALLOY.—H. C. Hall and Rolls-Royce, Ltd. May 1, 1937. 494,764.

Chemical and Allied Stocks and Shares

OWING to the developments in international political affairs conditions in the stock and share markets were rather depressed earlier this week and share values tended to move against holders. Later, however, there was some improvement and industrial and allied securities became more active.

Shares of companies identified with the chemical and allied trades reflected the surrounding tendency of markets, but in the majority of cases they are slightly higher on balance for the week. Imperial Chemical are 31s. 7½d. at the time of writing, compared with 31s. 3d. a week ago, while Murex are 78s. 9d., compared with 77s. 6d., and British Aluminium 54s. 3d., compared with 53s. Turner and Newall were reactionary, awaiting the past year's results, but United Molasses were inclined to show further improvement on market talk of a possible increase in the forthcoming dividend. Tube Investments were again firm, awaiting the full results. Lever and Unilever were slightly higher at 37s. on satisfaction with the maintenance of the interim payment.

Associated Cement, British Portland Cement and various other shares of cement companies were fairly steady, while British Plaster Board improved to 28s. 6d. awaiting the interim dividend declaration. Borax Consolidated have shown further improvement to 28s. 3d. at the time of writing.

Dorman Long were moderately lower despite the favourable impression created by the results and the maintenance of the dividend at 10 per cent. Consett, South Durham and various other iron, steel and kindred securities lost part of their recent improvement, but later a steadier tendency was in evidence in United Steel and Stewarts and Lloyds. International Nickel fluctuated in accordance with the day-to-day trend of Wall Street. Swedish Match at 29s. 3d. have held last week's rise.

Boots Pure Drug remained steady at 39s. 9d., while Timothy Whites and Taylors made the slightly higher price of 23s. 9d. British Drug Houses were held firmly and were inactive. Sangers were around the same price as a week ago. Triplex Glass did not keep best prices touched during the past few days, but at 34s. are 1s. better than a week ago.

Fison Packard and Prentice continued to change hands actively and have made the better price of 39s. at the time of writing. British Oil and Cake Mills preferred ordinary units were steady, as were United Premier Oil and Cake ordinary, although the latter did not appear to be very active. Michael Nairn improved further to 60s., a gain of 1s. 3d. on balance, while Barry and Staines made the better price of 36s. 6d. Wall Paper deferred was better at 35s. 9d., aided by the favourable impression created by the report and accounts. Imperial Smelting lost a few pence, but remained fairly active on the view that the outlook for the company is improving. Pinchin Johnson were little changed at 26s. 3d., while International Paint and other paint shares had a fairly steady appearance, including Lewis Berger. The full results of the latter company have now been issued.

Various textile shares, including Courtaulds, received attention, in advance of the terms of the Anglo-American trade agreement, but British Celanese ordinary and preference shares were dull awaiting the report and accounts. More activity was reported in Lancashire Cotton Corporation ordinary and preference.

Oil shares have been uncertain, tending to rather lower levels, particularly "Shell" and other shares which have an international market.

From Week to Week

OCTOBER DELIVERIES of beet at the British Sugar Corporation's Peterborough factory totalled about 60,000 tons.

PLANS ARE BEING PREPARED for the demolition of the existing building and the erection of an office at the works of Chance Brothers and Co., Ltd., glass manufacturers, Murano Street, Glasgow.

THE IRAQ CHAMBER OF DEPUTIES has approved the granting of an oil concession in Southern Iraq to the Basra Petroleum Co., a British concern. This company was recently formed in London with a capital of £1,000,000.

A RECENT MEETING of the East Anglian section of the Institute of Chemistry, addressed by Mr. H. B. Brown, who spoke on "War-time Chemical Problems," was attended by members of the local A.R.P. organisation and the St. John Ambulance Brigade.

AFTER A HEARING lasting nearly four days, an appeal by Stewarts and Lloyds against the assessment of its £3,000,000 steelworks at Corby, Northants, was dismissed, with costs, by the Northamptonshire Quarter Sessions Rating Appeals Committee on November 10.

FOR THE FIRST TIME IN GREAT BRITAIN tribute will be paid to the memory of Joseph Aspdin, the inventor of cement, in a ceremony on Thursday next at St. John's Church, Wakefield, where Aspdin is buried. Lord Wolmer, M.P., on behalf of the cement industry, will hand over to the care of the vicar a plaque within the church and memorial gates in the churchyard.

A NEW CANTEEN costing £10,000 was opened at the Washington chemical works, Washington, Co. Durham, last week by Mrs. G. S. Newall, wife of the firm's managing director. Presentations in recognition of long service were made to six employees by Mr. Newall. The Washington Chemical Co., celebrates its centenary in 1940.

CORNTON METALS, LTD., a company recently formed by a number of business men in Stirling, are to build a foundry at Cornton, Bridge of Allan, for the production of non-ferrous industrial alloys. The new building will be 100 feet long and 50 feet wide, and building operations will commence immediately. It is hoped to have the foundry ready to start production early in 1939.

THE SECRETARY OF STATE FOR SCOTLAND (Mr. Colville) stated in the House of Commons last week that at present the number of workers engaged in the Scottish shale oil industry was 4,904, and of that number 2,400 were on the spread-over system by which they worked three weeks out of four. As a result of the recent extensions full employment would be given to all the workers instead of the spread-over arrangement, and in addition 500 or 600 new workers would be engaged.

IMPERIAL CHEMICAL INDUSTRIES, LTD., have produced an addition to their range of pigment dyestuffs—Monolite Fast Orange GS. In paste and powder forms, it is claimed to possess high tinctorial value in oil media, very good fastness to light and good fastness to oil, water, alkali and lime. It is of particular interest for the production of printing inks, oil paints and enamels, and is also suitable for use in the production of wallpaper and paper surfacing colours, water paints, distempers and linoleum.

THE INSTITUTION OF GAS ENGINEERS has published "Gas Works Effluents and Ammonia," by Arthur Key, D.Sc., Ph.D., Research Chemist, The Institution of Gas Engineers (price 5s. net, cloth). It comprises a summary of the results of the investigations of the Liquor Effluents and Ammonia Committee, and its predecessors, of The Institution of Gas Engineers during the past twelve years, together with a comprehensive survey of the present state of knowledge regarding the problems connected with the recovery and utilisation of gas works ammonia and the disposal of effluents therefrom.

OWNED BY THE BRITISH OIL AND CAKE MILLS, LTD., the Phoenix Oil Mill, Norfolk Street, Liverpool, has ceased production. The adjoining compound mill, however, will continue to operate, but the seed-crushing will be carried out at the Manchester mill and the products sent to Liverpool. The Phoenix mill is 50 years old and Liverpool loses a valuable branch of the linseed oil crushing industry. Mr. G. P. Taylor, assistant manager in Liverpool, states that all employees displaced have been compensated, the largest grant being £300, though others might receive more in pension. About 60 employees are affected.

FOLLOWING REPRESENTATIONS from industrial quarters the National "Safety First" Association has decided to amend the conditions of the Travelling Safety Scholarship, details of which were recently announced. (THE CHEMICAL AGE, November 12, p. 366). Originally entry was described as being open to "students of recognised educational institutions" and "articled apprentices." Various industrialists have suggested that injustice would thereby be done to many suitable candidates who are certainly apprentices, but who have not been formally articled, and modification has accordingly been made so that young people in this category will be eligible for entry.

THE WORK OF RECONSTRUCTING the former Gateside bleaching works, Barrhead, has been commenced, and it is expected that operations will be completed by the end of the year. The works are to be re-opened by the Barrhead Kid Company.

APPLICATION FORMS (returnable December 20, 1938) and particulars of the Associate-Membership Examination for 1939 of the Institution of Chemical Engineers may now be obtained from the Hon. Registrar, Institution of Chemical Engineers, 56 Victoria Street, London, S.W.1.

THE EMPIRE AIR MAIL SCHEME whereby all first-class mails are carried by Imperial Airways without surcharge has presented the company with the greatest task any air transport company has ever been called upon to accomplish—the transport of a volume of Christmas mails of unprecedented dimensions. The company is appealing for the co-operation of business firms. It is suggested that firms might help by posting Christmas mail for overseas as soon as possible, posting their greetings progressively as they are ready and reducing the weight of their mails by the use of small Christmas cards and lightweight paper and envelopes.

THE DOMINION BUREAU OF STATISTICS has just completed a special survey of the consumption of chemicals in municipal waterworks in Canada during 1936 and 1937. More than 600 waterworks departments were circularised and only 206 reported the use of chemicals; 88 of these used chlorine only and 47 others used alum and chlorine only. In 1937 these waterworks used 4,705 tons of alum, 624 tons of chlorine, 610 tons of lime, 800 tons of salt, 202 tons of soda ash, 100 tons of sulphur dioxide, 13 tons of chloride of lime, 24 tons of activated carbon, 37 tons of ammonium sulphate and 3 tons of anhydrous ammonia.

SWITZERLAND'S CHEMICAL TRADE, which had accelerated during 1937, showed a falling off in quantity and value of both imports and exports during the first half of 1938, according to the American Consulate General at Basel. Total imports of chemicals and allied products amounted to 144,684 metric tons with a value of slightly less than 50,000,000 Swiss francs, compared with 163,730 tons, valued at slightly more than 56,000,000 Swiss francs, in the corresponding period of 1937. During the 1938 six months, exports amounted to 28,652 tons, valued at 79,470,000 francs, compared with 31,560 tons, 84,713,000 francs, in the 1937 period.

SOUTHAMPTON HAS UNDER CONSIDERATION BIG SCALE EXTENSIONS to the existing water supply services and a new scheme, which in detail has been devised by Mr. Joseph Hawksley, B.Sc., Borough Waterworks Engineer and Manager, will be proceeded with in three similar sections; subject to confirmation by the Corporation. The first section, to be completed by 1941, will include screening, purification, sterilising and water-softening plant, and the entire scheme is estimated to cost £190,000. The main parts of the plan, estimated to cost £119,000, are: intake and screening works, purification plants, mains, pumping stations, filtered water reservoir. An expenditure of £41,712 is envisaged in respect of the "purification works" section. A start on this first stage will enable the subsequent stages of the works to be completed as public need arises and according to routine.

AT A RECENT MEETING of the Portsmouth and District Chemical Society, with Dr. C. G. Lyons in the chair, a lecture on "The Chemistry of Photography," was given by Mr. R. F. W. Selman, M.Sc., of the Research staff of Kodaks, Ltd. He showed first how through progressive sensitisation of emulsions by dyestuffs, the scope of photography had been extended. To-day, emulsions could be sensitised to respond efficiently to the shorter wavelengths, thence throughout the visible spectrum and far into the infra-red region. Mr. Selman dealt with process and reaction of constituent chemicals in developers, the behaviour of different types of emulsion being illustrated by slides of their characteristic curves. The connection between the degree of contrast of the finished negative and the action of the developer was enlarged upon, as were the practical problems of "granularity" in emulsions and factors which lead to appearance of grain in negatives.

SIR ROBERT H. PICKARD, Director of Research, the British Cotton Industry Research Association, at the annual meeting of the Association at Manchester last week, recalled the fact that more than £500,000 had been contributed to the Shirley Institute during the past 20 years. He stated that when the Institute was formed 20 years ago there was a group of laboratories surrounding a small experimental mill. They were now able to use machinery to produce textile goods in order to save the time lag between an idea being tested in the laboratory and its practical application. They were able now to see the behaviour of material from the bale to the finishing process. He expected that their programme of research would necessitate their asking for their resources to be increased by about 50 per cent. Mr. H. S. Butterworth, said that the staff of the association now exceeded 330, about one-fourth of whom were university graduates.

Weekly Prices of British Chemical Products

A CONTINUANCE of steady conditions characterise most sections of the chemical market this week. Formaldehyde is in active demand and a good inquiry has been circulating for fertiliser materials. Acetone is lower in quotation, but lead acetate is reported to be a little better. Deliveries under existing commitments are going forward in fair quantities and an increasing activity in forward bookings has been witnessed. Contract price arrangements for 1939 have been announced for acetic acid, formic acid and boric acid and current rates for these items are to be continued. There has been very little improvement in the demand for coal tar products and the market on the whole has a dull appearance.

MANCHESTER.—Prices remain steady to firm in most sections of the Manchester market for chemical products and interest in contracts for delivery over varying periods of next year is growing. The next week or two should witness a fairly active movement in this respect. In the meantime, the movement of supplies into consumption against contracts is on a moderate scale, whilst moderate sales of small prompt lots have been reported. With regard to the by-products, prices have mostly been maintained at around their recent levels, although in a few instances the tendency is still rather easy. A little more inquiry has been experienced and some expansion in business is hoped for.

Price Changes

Rises: Aluminium Sulphate (Manchester); Copper Sulphate (Manchester and Scotland).

Falls: Potassium Prussiate; Acetone.

GLASGOW.—There has been a slight improvement in the general demand for chemicals for home trade during the week, but export business still remains very quiet. Prices, however, continue very firm at previous figures, and contracts are also now being arranged for a good many items for delivery up to the end of June, and in several instances to the end of 1939, mostly at current prices.

General Chemicals

ACETONE.—£40 to £43 per ton.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 15s. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. pe. lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5½d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9½d. to 11½d.

POTASSIUM PRUSSIATE.—5¾d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

Soda, Caustic.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. Scotland: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£19-£20 per ton carriage paid North. Glasgow: £18 10s. per ton net ex store.

Sodium Bicarbonate.—Refined spot, £10 15s. per ton d/d station in bags. Glasgow: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. Manchester: £10 15s.

Sodium Bisulphite Powder.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£27 10s. to £32 per ton. Glasgow: £1 11s. per cwt., minimum 3 cwt. lots.

Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

Sodium Chromate.—4½d. per lb. d/d U.K.
4d. per lb. Glasgow: 4½d. net, carriage paid.

Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. Manchester: Commercial, £11; photographic, £15 10s.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. Glasgow: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

Sodium Nitrite.—£18 5s. per ton for ton lots.

Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

Sodium Prussiate.—½d. per lb. for ton lots. Glasgow: 5d. to 5¾d. ex store. Manchester: 4½d. to 5d.

Sodium Silicate.—£8 2s. 6d. per ton.

Sodium Sulphate (Glauber Salts).—£3 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 12s. 6d.

Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. Manchester: Concentrated solid, 60/62%, £11; commercial, £8 10s.

Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

Tartaric Acid.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. Manchester: 1s. 1¼d. per lb. Glasgow: 1s. 1½d. per lb., 5%, ex store.

Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.

Barytes.—£6 to £6 10s. per ton, according to quality.

Cadmium Sulphide.—3s. 6d. to 3s. 9d. per lb.

Carbon Black.—3¾d. to 4 1/16d. per lb., ex store.

Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.

Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.

Chromium Oxide.—Green, 10½d. to 11½d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes.—White, 4¾d. to 5½d. per lb.; dark 3¾d. to 4½d. per lb.

Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

Lead Hyposulphite.—9d. per lb.

Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.

Sulphur Chloride.—5d. to 7d. per lb., according to quantity.

Vermilion.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.

Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939.

Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. Glasgow: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4¼d. Manchester: Pure, 1s. 8d. per gal.; crude, 1s. per gal.

Carbolic Acid.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7¼d. to 1s. 10½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

Creosote.—Home trade, 4d. per gal., f.o.r. makers' works; exports 6d. to 6½d. per gal., according to grade. Manchester: 3¾d. to 4¼d. Glasgow: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

Cresylic Acid.—97/99%, 1s. 9d. to 2s.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 1d. to 2s. 3d.; Dark, 95%, 1s. 7d. to 1s. 8d. per gal. Glasgow: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. Manchester: Pale, 99/100%, 1s. 10d.

Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. Glasgow: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

Naphthalene.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £11 per ton in 2-cwt. bags. London: Fire lighter quality, £3 to £4 10s. per ton. Glasgow: Fire lighter, crude, £6 to £7 per ton (bags free). Manchester: Refined, £12 to £13 per ton f.o.b.

Pitch.—Medium, soft, 31s. per ton, f.o.b. Manchester: 31s. f.o.b., East Coast. Glasgow: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

Pyridine.—90/140%, 12s. to 13s. per gal.; 90/160%, 9s. 8d. to 11s. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. Glasgow: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. Manchester: 10s. to 12s. per gallon.

Toluol.—90%, 1s. 10d. per gal.; pure 2s. 2d. Glasgow: 90% 120, 1s. 10d. to 2s. 1d. per gal Manchester: Pure 2s. 4d. per gallon, naked.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. Glasgow: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 5s. to £8 10s. Manchester: Brown, £8s. 10d.; grey, £9 15s.

Methyl Acetone.—40.50%, £32 to £35 per ton.

Wood Creosote.—Unrefined, 6d. to 8d. per gal., according to boiling range.

Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.

Wood Tar.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.

Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

***m*-Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.

***o*-Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.

***p*-Cresol, 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.

Dichloraniline.—2s. 1½d. to 2s. 5d. per lb.

Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.

Dinitrobenzene.—7½d. per lb.

Dinitrochlorbenzene, Solid.—£79 5s. per ton.

Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.

Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

Naphthionic Acid.—1s. 10d. per lb.

β-Naphthol.—£97 per ton; flake, £94 8s. per ton.

***α*-Naphthylamine.**—Lumps, 1s. 1d. per lb.

***β*-Naphthylamine.**—Spot, 3s. per lb.; d/d buyer's works.

Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.

***o*-Nitraniline.**—4s. 3½d per lb.

***m*-Nitraniline.**—Spot, 2s. 10d. per lb. d/d buyer's works.

***p*-Nitraniline.**—Spot, 1s. 10d. to 2s. 1d. per lb. d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—9½d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

Sulphanilic Acid.—Spot, 8½d. per lb. 100%, d/d buyer's works.

***o*-Toluidine.**—10½d. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—1s. 10½d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 3d. per lb., 100%.

Forthcoming Events

London.

November 21.—Chemical Club. 2 Whitehall Court, S.W.1. 8.15 p.m. Dr. I. Frost, "Some Modern Approaches to Problems of Psychiotry."

Royal Society of Arts. John Street, Adelphi, W.C.2. 8 p.m. Cantor Lecture. J. H. Partridge, "Refractory Materials."

November 22.—University of London. 5 p.m. Dr. L. Margaret Kerby, "Muscle Chemistry."

Institute of the Plastics Industry. Caxton Hall, Westminster, S.W.1. 7.30 p.m. R. Cottrell-Butler, "Plastics and Architecture."

Annual Chemical Dinner. Connaught Rooms, Great Queen Street, W.C.2. 7.30 p.m.

November 23.—Association of Scientific Workers. University College, Gower Street, W.C.1. 8.15 p.m. Professor W. C. Cullis, "The Film in Education."

November 24.—Chemical Society. Joint meeting with the Society of Chemical Industry. Leathersellers Hall, St. Helen's Place, E.C.3. 5 p.m. Lecture to commemorate the Centenary of the birth of Sir William Henry Perkin. H. Levinstein, "Sir William Perkin's Adventure and What has come of it."

November 25.—Institution of Chemical Engineers. Institution of Civil Engineers, Great George Street, S.W.1. 6.30 p.m. Professor J. C. Philip, "Fog and Mist from the Physico-Chemical Standpoint."

Joint Committee on Materials and Their Testing. Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. 10 a.m. and 2 p.m. Discussion on "Non-Destructive Testing."

November 26.—British Association of Chemists. Waldorf Hotel, W.C.2. Annual General Meeting. 3 p.m. 21st Anniversary Dinner. 7 p.m.

Bangor.

November 25.—Chemical Society. University College. 5.30 p.m. Professor J. R. Partington, "The Origins of the Atomic Theory."

Birmingham.

November 24.—Institution of Civil Engineers. James Watt Memorial Institute, Great Charles Street. 6 p.m. Professor K. Neville Moss, "Work in Asphyxiating Atmospheres."

Bristol.

November 24.—Institute of Chemistry. The University, Woodland Road. 5.30 p.m. Dr. A. D. Mitchell, "Two New Types of Indicator."

Dublin.

November 23.—Institute of Chemistry. Annual general meeting. University College, Upper Merrion Street. 8 p.m.

Edinburgh.

November 28.—Institute of Chemistry. Joint meeting with the Society of Chemical Industry. North British Station Hotel, Princes Street. 7.30 p.m. Mr. A. R. Jamieson, "Chemistry in the Service of the Community."

Huddersfield.

November 21.—Institute of Chemistry. Dr. C. Ainsworth Mitchell, "Identification in Criminology."

Leeds.

November 21.—Institute of Chemistry. Annual general meeting. University, Woodhouse Lane. 7.30 p.m. Dr. J. J. Fox, "Some Infra-red Themes."

Manchester.

November 21.—Institution of the Rubber Industry. Engineers' Club, Albert Square. 7.30 p.m. A. E. T. Neale, "Some Aspects of the Dust Problem as encountered in Rubber Manufacture."

November 22.—Manchester Chemical Club. Ivan Levenstein Memorial Lecture. Professor A. G. Green, "Manchester Chemistry and Chemists of the Nineties."

November 24.—Institute of Brewing. Midland Hotel. Dr. R. Seligman, "Metallic Corrosion."

November 25.—Manchester Literary and Philosophical Society (Chemical Section), 36 George Street. 7 p.m. H. E. Mellor, "Automatic Fire Protection."

Newcastle.

November 24.—Coke Oven Managers' Association. W. J. Carter, "New Factory Act."

Norwich.

November 22.—Institute of Chemistry (East Anglian Section). Joint Meeting with Norwich Medicochirurgical Society. Technical College. A. L. Bacharach, "Food and Medicine."

Nottingham.

November 24.—Chemical Society. Joint meeting with the University College Nottingham Physical and Chemical Society. University College, University Park. 5.15 p.m. Professor F. Challenger, "Some Chemical Aspects of a Widespread Phenomenon Biological Methylation."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

SKUSE AND CO., LTD., London, W.C., manufacturing chemists. (M., 19/11/38.) November 5, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. * Nil. May 20, 1938.

Receiverships

A. L. ARNOLD AND COMPANY (MANUFACTURING), LTD. (formerly A. L. Arnold and Co., Ltd.), chemical manufacturers, etc., 17 Plough Court, Fetter Lane, E.C.4. (R., 19/11/38.) J. Crichton-Helme, 27 Chancery Lane, W.C.2, has been appointed receiver, November 3, 1938, under powers contained in instrument dated July 16, 1934.

Companies Winding-up Voluntarily

DEASON CHEMICAL CO., LTD. (C.W.U.V., 19/11/38.) By special resolution, October 31, 1938, C. O. Tiley, 24-26 Side, Newcastle-upon-Tyne, 1, appointed liquidator. Liquidator to register new company, The Deason Chemical Company (1938), Ltd.

Company News

Vitamins, Ltd., have declared an interim dividend of 10 per cent.

A. B. Fleming and Co., printing ink makers, etc., have decided to maintain the interim dividend at 5 per cent., less tax, in respect of the year ending April 30, 1939.

British Cotton and Wool Dyers' Association, in an interim statement for the six months ended September 30, report a loss of £8,466, against a profit of £27,092 for the corresponding period last year. The credit balance carried forward is reduced to £46,293.

Lever Brothers and Unilever, Ltd., and **Lever Brothers and Unilever, N.V.,** have declared interim dividends of 4 per cent. and 3 per cent., respectively, on their ordinary capitals, payable on December 1 next. Similar interim dividends were paid last year.

Skuse and Company, Ltd., manufacturing chemists, have increased their nominal capital by the addition of £3,000 beyond the registered capital of £2,000. The additional capital is divided into 2,000 5½ per cent. redeemable cumulative preference and 1,000 6 per cent. redeemable cumulative preference shares of £1.

Associated Dyers and Cleaners, Ltd.—The directors of Associated Dyers and Cleaners, Ltd., have received an offer from Johnson Brothers (Dyers), Ltd., to acquire for cash the whole of the issued capital of the company on the basis of 8s. 6d. for each 10s. ordinary share and 1s. 6d. for each 1s. deferred share.

Brown, Bayley's Steel Works, Ltd., for the year to July 30, report a trading profit of £160,897 (£145,246). Net profits work out at £154,449 (£138,368); £50,000 (£25,000) is transferred to general reserve, £25,000 to obsolescence and £37,911 is carried forward. The ordinary dividend for the year is 15 per cent. (10 per cent.), tax free.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Denmark.—Agent, well established in Copenhagen, with excellent connections, desires to obtain for Denmark representation, on a commission basis, of producers of chemical products and essential oils. Extensive experience, highest references. Apply, Box No. S.313, "Board of Trade Journal," H.M. Stationery Office, Princes Street, Westminster, London, S.W.1.

British India, Burma and Ceylon.—A well-established firm of merchants and agents at Bombay wishes to obtain the representation, on a basis to be arranged, of United Kingdom manufacturers of patent medicines and druggists' sundries, and paints for India, Burma and Ceylon. (Ref. No. 344.)

Ceylon.—A well-established firm of merchants and agents at Colombo wishes to obtain the representation, on a basis to be arranged, of United Kingdom manufacturers of linseed oil and turpentine for Ceylon. (Ref. No. 346.)